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TRANSACTIONS

OF THE

BRITISH CONGRESS ON TUBERCULOSIS

FOR THE

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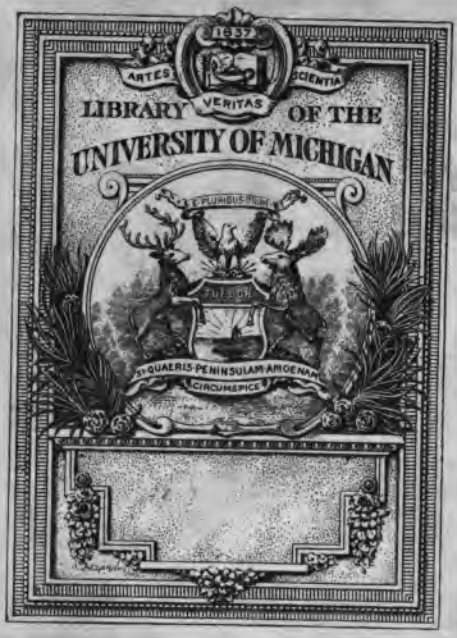
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TRANSACTIONS

OF THE

British Congress on Tuberculosis

FOR THE PREVENTION OF CONSUMPTION. London, 1901.

LONDON, JULY 22nd to 26th, 1901.

Patron:
HIS MAJESTY THE KING.

President:
FIELD-MARSHAL H.R.H. THE DUKE OF CAMBRIDGE, K.G.

VOLUME IV.

THE VETERINARY SECTION.

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SECTION IV.

VETERINARY (TUBERCULOSIS IN ANIMALS).

(Meetings in the Marlborough Hall, adjoining the Polytechnic, Regent Street, from Tuesday to Friday, 9.30 to 1.30.)

4

President.

SIR GEORGE BROWN, C.B.

Vice-Presidents.

Professor McFADYEAN, M.B., C.M., B.Sc., M.R.C.V.S.
Professor DEWAR, F.R.C.V.S.
Professor McCALL, F.R.C.V.S.
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Professor WOODRUFF, M.R.C.V.S., Royal Veterinary College, Camden Town, N.W.

THE first meeting of the section was held in Marlborough Hall, adjoining the Polytechnic, Regent Street, on Tuesday, July 23rd; the President of the Section, SIR GEORGE BROWN, C.B., occupied the Chair.

The subject for discussion was—

THE DIAGNOSIS OF TUBERCULOSIS IN ANIMALS DURING LIFE.

The discussion was opened by PROFESSOR DEWAR, F.R.C.V.S., Principal of the Royal Veterinary College, Edinburgh, with the following remarks:—

As time is limited, and as tuberculosis is of greatest importance to the veterinary profession as occurring in the ox, it will be advisable to confine our observations to the diagnosis of the disease in the bovine species.

Having practised at a time when there was nothing to rely on to assist our diagnosis but the older clinical methods, I am able to appreciate these without failing to estimate at their true value the methods introduced subsequent to the discovery of the causal organism of the disease by Dr. Koch. Previous to that date the seriousness of the affection, its contagious nature, and the extent of its spread amongst the herds of our country, were only suspected by a few, although prior to that date I had already dealt with it as an actively contagious disease.

As our subject is not semiology but diagnosis, it will be unnecessary to

dwell on the primary symptoms of the disease. It is not uncommon for its first appearance to be indicated by a rough harsh sound in the throat during respiration, especially in young animals and heard best when the head is lowered in feeding. There may be nothing else. Possibly on manipulation an enlargement may be made out in the upper parotid region. The history will assist. The prevalence of tuberculosis in the herd, or of actinomycosis in the district. When a tumour begins to project externally in the same region it can generally be distinguished from actinomycosis. The tubercular tumour becomes adherent to the skin over a single central area as a rule. As often the actinomycotic tumour forms more than one point of adhesion, and subsequently of softening. If enlarged lymphatic glands can be made out about the root of the neck or elsewhere diagnosis is practically confirmed, while with actinomycosis the jaws, tongue, or lips are more frequently involved.

But as in about 75 per cent. of cases of tuberculosis the thoracic organs are early affected, it becomes a question of diagnosing the disease within the chest.

If in a cow, and it is often in a cow, she may be observed to give an occasional cough without anything very characteristic about it. It can often be induced by turning her out of the warm byre into the colder atmosphere outside, or by any excitement or disturbance, but her health is not affected and the owner thinks nothing of it.

By-and-by, although feeding all right and giving an ordinary amount of milk she begins to lose condition, the hair becomes dry, and if in the byre she may be found sweating over the shoulders in the mornings. Very often a peculiar facial expression, the outward and visible indication of the tubercular diathesis, becomes apparent to the experienced observer. Before emaciation is at all pronounced the skin becomes firmer, it is less soft, supple, and movable, and more adherent to the subcutaneous tissues. Pinching over the back or loins may cause the animal to cringe, and in the intercostal spaces may be manifestly painful. The cough becomes more frequent, more spasmodic, occurring in fits, and is sometimes evidently painful. Still most of these symptoms may be present in other diseases—the emaciation, the cough, etc., although the hide-bound condition is seldom so pronounced, so distinct, at such an early stage as it is in tuberculosis. Amongst these diseases are chronic bronchitis, verminous broncho-pneumonia, and the presence of hydatids in the lungs, contagious pleuro-pneumonia, and foreign bodies passing forwards from the stomach. The two latter should not be difficult to distinguish. Verminous bronchitis usually affects a number of individuals, and the cough, emaciation and other symptoms are quite different, and the presence of hydatids is indicated by complete dulness on percussion in one or more pulmonary areas. From chronic bronchitis if accompanied by emaciation the differential diagnosis is more difficult.

On percussion there may be little to distinguish them—in bronchitis there may be no perceptible alteration on percussion, and if accompanied by pulmonary emphysema the resonance may even be increased. But there may

be no diminished resonance in pulmonary tuberculosis where miliary tubercles are scattered throughout the lungs, at least in the upper part of the chest the resonance may even be increased, although it is often somewhat diminished, there is some perceptible dulness towards the lower and anterior parts of the chest.

On auscultation the vesicular murmur is heard louder and harsher than normal over the upper half of the chest. Towards the lower borders of the lungs it becomes weaker and may be almost imperceptible towards the middle and anterior regions of the chest, or bronchial sounds may completely disguise it. There may be nothing heard but sibilant râles and sonorous rhonchi which become displaced, or altered on coughing. There can also be observed —what can also be seen while standing watching the animal breathing—a difference in the relative length of the inspiration and expiration. The expiration is prolonged, longer than the inspiration. If there is perfect quietness this can be clearly made out on auscultation. The vesicular murmur is distinctly heard during expiration, and as distinct towards the end of the expiratory act as at the beginning. This never occurs in health, nor am I aware that it occurs in any other disease.

In chronic bronchitis the vesicular murmur is also louder and harsher than normal, but it can be heard over all the chest, except where it may be nearly disguised by loud abnormal bronchial sounds. But the expiratory movement is shorter than the inspiratory, and on auscultation the vesicular murmur is only heard at the start of the expiratory movement.

Although the departure from the normal in the relative length of the inspiratory and expiratory movement can be easily seen as a rule, it requires perfect quietness to allow one to be able to appreciate the difference in the respiratory sounds on auscultation. With a large number of cows in a byre, with chains rattling here and there it is perfectly useless attempting it.

But tuberculosis frequently affects other organs as well as the lungs, and our older clinical methods are often unequal to the formation of a definite diagnosis. The most important of these other organs, from a public health point of view, is undoubtedly the mammary glands. Increased experience leads me to believe that the number of tuberculous cows affected with tubercle of the udder is greater than that usually estimated, *i.e.*, about 3 per cent. Apart from cows that are only recognised as tuberculous through the action of tuberculin, I think the percentage would be from five to seven.

In the udder the progress of the disease is often slow, and there is no doubt but it may exist for weeks in such a condition as to render the milk dangerous before the most expert clinician could detect its presence. The posterior quarters, one or both, are most frequently affected, and although sometimes acute it is seldom distinctly painful. As a rule the swelling is more or less diffuse, not often nodulated, and the physical characters of the milk are at first very little changed, less so than with a non-specific inflammation or "weed." On the other hand one quarter of the udder or more may become rapidly enlarged, hard, brawny, although but little painful, and it should not be mistaken for a simple inflammatory induration.

This brings us to bacteriological diagnosis which is of most general use in the examination of milk, a subject which I cannot enlarge on at this time.

It can also be applied to discharges from the nose, to matter coughed up, or scraped or sponged off the pharynx, while the tongue is secured, after causing the animal to cough, to the pus from the suppurating tumours, from cold abscesses, to any suspected discharge from the vulva, and to particles of tissue abstracted from an enlarged mammary gland, lymphatic gland, or even tumour, by the pathological harpoon. The demonstration of the tubercle bacillus under the microscope is distinct evidence of the presence of the disease.

Dr. Ferran, Director of the Bacteriological Laboratory, Barcelona, has published a statement that the tubercle bacillus possesses the curious property of producing in certain media a substance which emits a peculiar easily recognisable odour not unlike that of "human sperm," that the best medium for this purpose is the serum of a sheep, which has been hyperimmunised by cultures of the bacillus, and that when a little of the medium is shaken up with a drop of the suspected tuberculous matter, and kept at a temperature of 29 to 30° C. for thirty-six hours, if Koch's bacillus is present the characteristic odour is easily recognised. He asserts that this method gives positive and reliable results where the microscope has failed to detect the bacilli. I have not observed any confirmation of this method of diagnosis by other experimenters.

Of more importance it seems to me is the agglutinating power of tuberculous serums, or even tuberculous effusions. As early as 1898 attention was directed to this method by M. Arloing, Director of the Veterinary School of Lyons. He seems to consider the method of great importance in diagnosing tuberculosis in the early stages in the human subject.

Experimenting on cattle he found that the blood serum of healthy adult cattle had an agglutinating power on tubercle bacilli in a "bouillon" culture, but that the power was only feeble, whereas the agglutinating power of the serum of tuberculous cattle was much more powerful; and he states that in this manner the presence or otherwise of tuberculosis in the animal from which the serum is obtained can be determined. He claims that this method of diagnosis is calculated to be of great usefulness in cases where fraudulent means have been used in order to prevent the usual reaction from tuberculin. This failure to react to the tuberculin test may be brought about by repeated injections of tuberculin, and probably by other means, which perhaps had better not be specified here. The agglutination method might therefore prove of great value to port veterinary inspectors and those interested in preventing the importation of diseased animals.

At the same time it is not a method which can be readily applied by every practising veterinary surgeon. It requires a considerable familiarity with bacteriological methods, with laboratory technique. It is necessary to have a culture of the tubercle bacilli in which the organisms are uniformly distributed throughout the culture media so that it has a homogeneous appearance from top to bottom. M. Arloing states that to a little of this culture in a small test tube a few drops of blood serum from the animal to be tested are added, shaken together, and the tube left upright. He adds that agglutination commences

almost at once, that it becomes visible to the naked eye in five or six hours, and is complete in twenty-four hours. The agglutination is characterised by a turbidity in the tubes, the bacilli forming into small clots which soon sink to the bottom of the tubes, leaving an absolutely transparent liquid above, if the agglutination has been complete. The amount of serum required to cause complete agglutination of the bacilli is used to estimate the agglutinative power. Thus if fifteen drops of serum are required to cause complete agglutination in sixty drops of the culture, he says that the serum has an agglutinative power of one in five. He states that this is practically the agglutinative power of the blood serum in healthy adult cattle, while that of calves under two months old is not over one in two, and that of tuberculous cattle is as high as one in ten and even more. Consequently an animal, according to M. Arloing, the blood serum of which has an agglutinative power of one in ten and over, should be considered tuberculous.

As far as the human subject is concerned, this method has been tried by several experimenters, and very varying verdicts given regarding it. In the *British Medical Journal* of May 4th last it is stated that Courmont, after a long series of experiments, mostly with pathological effusions—pleural and ascitic effusions and cerebro-spinal fluid—concludes that "serum diagnosis, in cases of effusion, is likely to prove of immense value." That is in the human subject. When the diagnosis may remain doubtful, he recommends that the agglutinating power of the blood ought to be compared with that of the pathological effusion.

Bendix regards the agglutination of the bacilli as a very favourable method of diagnosis. On the other hand, Beck and Rabinowitsch say it is unreliable, whilst Fraenkel considers it of no practical value.

It will be cause for regret should those pessimistic estimates prove correct, as a supplementary method to those already recognised would be often very useful.

But the introduction of tuberculin gave us the most efficient, reliable, and practical means we yet possess of diagnosing tuberculosis. At first hailed as a beneficent agent in curing the disease in the human subject, it was soon found that the too sanguine hopes entertained regarding its curative properties —whatever future experience may yet prove these to be—were doomed to disappointment, and it is to-day recognised as being of more value to the veterinary surgeon as a diagnostic agent than for any other purpose.

Notwithstanding the many attempts to discredit its diagnostic value, and expressions of scepticism when reactions were very numerous; notwithstanding the cases—numerous cases, shall I say?—of reputed failures, published and made much of, mostly in agricultural journals, how seldom it is that any complaint of failure in its action is seen in a scientific journal, notwithstanding the extent to which it has been decried, it is by a long way the most reliable, the most practicable, and the most uniformly useful means of diagnosing nascent or latent tuberculosis that we possess. In fact, we have no other of any practical value, for those methods we have been considering, whatever value they may be found to possess, are as yet scarcely

out of the experimental stage. For the full and successful use of tuberculin as a diagnostic agent, several things are required:—

1. A thoroughly reliable tuberculin. There is no doubt but there are tuberculins and tuberculins, and as tuberculin can have no definite and unalterable chemical composition there is no security for its quality but in having it properly prepared by a competent pathologist or pathological chemist, and carefully tested before being sent out for general use. Then, whether it is in the form of a powder or a solution, whether concentrated or diluted, it ought to be thoroughly safe and reliable in certain stated doses as a test for tuberculosis.

2. That the herd to be tested should be kept quiet and undisturbed, without any pronounced change in food, in pasturage, in surroundings, in management of any kind for ten to fifteen days prior to the application of the test. The recurrence of the usual genesic phenomena renders the female, for the time, less fit to undergo the test. And if at large in a field amongst others, she may disturb the result of the test in a considerable number of animals. In our more northern latitudes we have some advantage in the application of the test over those situated farther south. When animals are tied up for the winter there is almost an ideal condition for the application of the test. It is much to be preferred to doing it while they are out at pasture. The length of the winter also enables the test to be applied to a herd twice a year while housed, at practically six months' interval.

3. That the veterinary surgeon be allowed perfect freedom and every facility in the application of the test. With plenty of willing and intelligent assistants there should be very few mistakes, very few doubtful reactions. There is no doubt but a very prevalent thoughtlessness on the part of owners of stock in disarranging animals or in carelessly introducing some disturbing element is frequently the cause of doubtful results which otherwise would be distinct and reliable.

The test being finished, a proper reading and proper understanding of the temperature chart is necessary to a correct allocation of the animals. A normal reaction in a tuberculous animal begins about the ninth or tenth hours, attains its maximum from about the thirteenth to the seventeenth hours, and again gradually falls. Any sharp sudden rise in temperature with sudden fall, or any drop and subsequent rise during the reaction, should be looked on with suspicion. Also any delayed and sudden rise, although I have seen an early sharp rise in very tuberculous animals and the rise delayed in old animals but slightly affected, still cases would require to be multiplied before these could be considered of diagnostic significance. Then what rise of temperature should be considered as diagnostic of tuberculosis? First let me deprecate the fixing of any definite temperature the rising above which should be considered sufficient to condemn the animal. This has been done in printed instructions sent out with tuberculin. The reaction should only be considered as the extent of the rise above the normal temperature, and that should be ascertained by taking it repeatedly, finding it practically steady, and taking the mean. A variation of $1\frac{1}{2}^{\circ}$ F. will often be found in animals in

perfect health, and while 101° may be normal in one animal, it may be 102½° in another.

When I first commenced to use tuberculin any animal giving a reaction of 2½° F. or over was condemned, any one in which the reaction was not over 1½° was considered healthy, while those in the intermediate zone were classed as doubtful.

Now although nineteen out of every twenty tuberculous animals will give a reaction of over 2½° F. under favourable circumstances with reliable tuberculin, and in nineteen out of every twenty healthy animals the temperature will not rise over 1½° F., yet increased experience leads me to believe that most of those animals giving a reaction over 2° F. and formerly classed as doubtful ought to be considered tuberculous.

One thing which tends to cast discredit on the tuberculin test is the attempts that are made, sometimes countenanced in high places, to test animals on the cheap. The temperatures are never taken until the tuberculin is about to be injected, and only at the 12th, 15th, and 18th hours thereafter, and the investigator goes away with his chart satisfied that he has done his duty. In all cases it ought to be taken at the 9th hour and on to the 18th. In some cases useful evidence may be obtained an hour or two later. Then as the taking of the temperatures even every three hours usually requires the continuous attendance of an assistant, they should be taken every two hours unless the herd is a very large one where a host of assistants would be required.

By attending to this the thermic curve obtained is more continuous and more satisfactory than when short, abrupt, and stilted.

I wish here to emphasise the fact that a willing faith, an intelligent belief in the reliability of the test, and in the contagious nature of the disease on the part of the owner is a very important factor in its application, and in the ridding of a herd of this terrible scourge. Of course occasional doubtful reactions will occur, but on retesting a month later most of these will give some distinct indication.

I have every sympathy with those gentlemen, mostly breeders of pedigree stock, who adopt a very sceptical, not to say unbelieving, attitude towards the test. They should retain an open mind. It is very disconcerting to be told that a large number of their best and most valuable animals, apparently in the bloom of health, are the subjects of tuberculosis. Little wonder if the veterinary surgeon has been sometimes stopped in the execution of the test, and firmly asked to leave the byre.

When every precaution is taken and the test carefully applied, at least 98 per cent. of the results will be correct and definite. It is almost as was stated in the summing up of a report by the Veterinary Inspector to the Board of Public Health of Victoria two years ago. After testing 297 dairy cows in a number of different dairies, he said: "When tuberculin indicated that tuberculosis was present, tuberculosis was found; and when tuberculin indicated that tuberculosis was not present, tuberculosis was not found." None of our methods are so perfect but that they are capable of improvement.

Professor NOCARD, of Alfort, said: The clinical diagnosis of tuberculosis in cattle is generally very difficult, even when the disease is in an advanced stage, and when diagnosis seems clear there are many possibilities of error; therefore, to make sure, it is better to have recourse either to the tuberculin test, to bacteriological examination, or inoculation with the suspected products.

I.—*Bacteriological Examination and Inoculation.*

These methods of diagnosis are most valuable. When the result is positive, the diagnosis is an absolute certainty, but they cannot be put into operation unless one has the suspected product at one's disposal for examination or inoculation.

How can the veterinary surgeon obtain this suspected product?

If it is a case of an external tuberculous lesion, whether ulcerating or not, or a suspected gland, or a uterine lesion accompanied by a vaginal purulent discharge, or even a case of pulmonary tuberculosis with buccal expectoration after fits of coughing, nothing could be simpler—the pus is collected or drained from the gland or the inflamed lymphatic, and examined or inoculated.

Tuberculous mammitis is a rare lesion and not seen in more than 2 per cent. of tuberculous cows. Its diagnosis is both urgent and difficult; the clinical symptoms are vague, and generally point to a range of probabilities which are more or less certain. Even if the cow has reacted to tuberculin, it does not necessarily follow that the induration of its udder is tuberculous, for tuberculous cows, as well as healthy ones, are liable to contract mammitis of various natures.

The bacteriological examination of milk is sufficient occasionally for immediate diagnosis, but, except in cases where the lesion is extensive and the bacilli very numerous, the result is generally negative, the bacilli being scattered in such an enormous quantity of liquid, of which the microscope can only deal with an infinite fraction. By centrifugalising the suspected milk it is easier to see the bacilli in the glairy deposit at the bottom of the tube, but the centrifugal machine is an expensive instrument of which few veterinary surgeons can avail themselves. The simplest and surest method of making the diagnosis is to operate upon the indurated portion of the udder with a trocar, a harpoon similar to those exhibited at the Congress, and of which I have the honour to bring a specimen under your notice.*

By means of this trocar one can extract a small fragment of tissue from the indurated portion of the udder, with which one is enabled to make a successful examination and a rapid diagnosis.

The use of this trocar has helped me greatly, and has led me to determine

* These trocars are from 2 to 3 millimetres in diameter. The point is conical instead of three-sided, thus avoiding the action of the sharp angles of the ordinary trocar, that sometimes give rise to slight hemorrhage, and tinge the milk with blood for two or three days; but the conically pointed trocar penetrates the skin with difficulty, so it is necessary to make a small incision with a lancet in the skin of the udder, through which to pass it into the mammary gland.

in an hour when cows are affected by tuberculous mammitis, where I should otherwise have had to have kept them under surveillance for several weeks if I had had to wait for the result of the injection of milk into the peritoneum of guinea-pigs.

When one has obtained the suspected product it should be bacteriologically examined, the presence of Koch's bacillus giving an absolutely certain diagnosis (except in the case of milk, which sometimes contains pseudo-tuberculous acid, producing bacilli like the Koch bacillus, and which can only be distinguished by the results of guinea-pig inoculation).

It must not be forgotten that the negative result of bacteriological examination does not prove that the product examined is not tuberculous for certainty; recourse must be had to inoculation and the inoculation must be practised on guinea-pigs.

The guinea-pig is, in fact, the best reagent for tuberculosis. When the guinea-pig resists a thorough inoculation it can be said that the product inoculated is not tuberculous.

Inoculation in the peritoneum is the process which produces death most rapidly, but when it is a question of verifying a diagnosis it is preferable to inoculate under the skin of the inner side of the thigh. If the product it tuberculous, after some days the lymphatic glands in the bend of the flank become enlarged and indurated, and often even fluctuating. One can operate on them and drain them for purposes of bacteriological examination without killing the animal, in whom the disease pursues its progressive course. Diagnosis can thus be made ten or twelve days after inoculation, much sooner than if one had to wait for the animal's death.

It is hardly necessary to say that it is wise to inoculate several guinea-pigs at the same time, to avoid a possible accident, especially if one has inoculated an impure product such as sputum or pus.

II.—*The Tuberculin Test.*

Bacteriological examination and inoculation are of no use in diagnosis if one cannot obtain some of the suspected product to examine and inoculate. This, however, is a very exceptional case. Until recent years veterinaries were often unable to state whether such and such a cow was tuberculous or not. They might have opinions or see probabilities, they had no means of ascertaining for certain. This is no longer the case. We possess in tuberculin a *certain* method for the diagnosis of tuberculosis, even when the lesions are of recent origin and very limited. There are thousands of cases which might be quoted to prove the incomparable diagnostic value of this most useful product. Everyone acknowledges that tuberculin proves the existence of lesions so remote as to be inaccessible to other methods; its only fault is that its indications are sometimes misleading.

The errors imputed to it are of two different kinds:

1. *It may produce reactions in non-tuberculous animals.*

2. *It may produce no reaction in animals whose autopsy has afterwards shown them to be tuberculous.*

Let us examine these two statements in turn :—

1. The first is absolutely wrong, but the error is explained by the incontestable fact that tuberculin can discover and denote the most minute tuberculous lesion with the same clearness and precision as large lesions in the lungs, lymphatic glands, liver, pleura, or peritoneum. So that one can well understand that the lesion, whose existence is shown by tuberculin, may, when it is very small, escape the veterinary surgeon's notice, especially when his examination is made on a carcass prepared for the butcher, as is the rule in an immense majority of cases.

Speaking for myself, I have, up to now, personally and publicly performed five hundred autopsies of animals which had reacted to tuberculin. In three cases only have I failed to find the lesion sought for; but sometimes it has taken a long time, half an hour, three-quarters of an hour, and more, before I could put my hand on some miliary granulations buried in the depths of the lung or scattered in the thickness of a lymphatic gland.

Therefore I take it upon myself to state that, *if occasionally the lesion shown by tuberculin is not found, it is because the search for it has been insufficient and the autopsy incomplete.*

The same reply might be made to those who, supported by the results of experiments, declare that certain diseases besides tuberculosis may also cause reaction to tuberculin. Then if a cow is affected with actinomycosis, verminous bronchitis, echino-coccus cysts, or liver fluke, etc., it does not necessarily follow that it is not at the same time tuberculous. When it reacts to tuberculin one may be assured that, besides the large lesions which call the clinician's attention, there also exists at the same time a tuberculous lesion, possibly very limited, which alone has caused the reaction.

2. *Tuberculous animals may not react to tuberculin.*

This is true—it generally happens in the case of animals with advanced tuberculosis with visible exterior indications, and the clinical diagnosis of which presents no real difficulties.

Sometimes, too, one finds in the post-mortem examination of animals which have not reacted minute lesions, fibrous or calcified in such a way that one is tempted to pronounce them cured; but, cured or not, such lesions show no tendency to increase, and they present really very little danger as regards contagion.

3. A more serious thing sometimes happens. A first injection of tuberculin may cause certain tuberculous cows to become tolerant to it, so that these cows will not react to a fresh test, but this immunity is rarely lasting; after a month it is unusual to find one which does not react again; the exceptions only apply to cows very slightly affected, with very small lesions already encysted—partially if not entirely cured. The preceding considerations resolve themselves more or less into the statement that—

When a cow reacts clearly to tuberculin it may be considered tuberculous.

The absence of reaction has not the same absolute value; a tuberculous cow may not react either: first, because the disease is very advanced, in

which case clinical examination will usually discover its presence; or, secondly, because the animal has recently been subjected to the tuberculin test, and it is therefore still tolerant to it. This latter possibility must be taken into consideration in the case of a recently purchased animal. It is better in such a case to delay the test until a month after the purchase of the animal—that is to say, until it shall be nearly certain to have recovered its aptitude to react. In operating thus one will not yet have an absolute certainty that the animal which does not react is free from tuberculosis; but one would be more or less sure that if it is tuberculous—and the chances would be against it being so—it would be in such a slight degree that its introduction into the common stable could not possibly harm the healthy animals near it. Experience shows, in fact, that lesions of this nature generally remain stationary or finally heal up; but if, on the contrary, they should ultimately begin to increase, a fresh injection, six months or a year after the first, would certainly disclose their existence before the animal had become really dangerous.

In conclusion, owing to the fact that the methods of diagnosis are now so far superior to those employed previously, it is possible to efficaciously combat tuberculosis in cattle and to render even a badly infected byre healthy in the space of a year. As, in addition, it has been firmly established that the calves of a tuberculous cow remain healthy when carefully separated from the mothers immediately after birth, and nourished on boiled milk by means of a feeding bottle, it is easy to thoroughly reconstitute the dairy and in a few years to bring it up to its original number without buying a single fresh animal.

Professor B. BANG, of Denmark, said: I am not at all prepared to say much on this subject to-day, but as I have for a long series of years been concerned with this question, I cannot help making a few remarks on this occasion. I will not go deeply into the question of the application of the tuberculin test. It is well known that I recommend the test very warmly, and that we have used it in Denmark for many years. On the whole, I agree with the opinions which have been expressed by the opener of the discussion and Professor Nocard; and I wish especially to say that I am glad to see that Professor Dewar advocates the taking of the temperature nine hours after the injection. I have seen many examples which prove that it is too late to begin to take the temperature twelve hours after the injection. I also agree that it is right to continue taking the temperature after the lapse of eighteen hours, as it happens, not infrequently, that a rise of temperature will occur rather late. With regard to the clinical diagnosis, it is of great value with injections of tuberculin. The chief point is that a veterinary surgeon who is called to see an animal with symptoms suspicious of tuberculosis is able, as soon as possible, to test these suspicions by means of the tuberculin test. There are two points I wish particularly to call attention to. The first is the diagnosis of tuberculous mammitis. I have been engaged on this question for years, and in 1884 I called attention to a matter which I considered of great importance, and I am sorry that veterinary surgeons who have written on the question seem in some cases not to be exactly of my opinion. I pointed out that in almost all cases

of tuberculous mammitis, in the beginning there will be found no change at all in the appearance of the milk. It seems to be milk, and every person will use it as milk, and it will be sold everywhere as milk. This continues for about a month, and after that time the milk will gradually assume a singular aspect, getting thinner and thinner, and flocculent. It is well known, of course, but there is not so much stress laid upon it as I think necessary. It is of great value to the veterinary surgeon to have it always in his mind, because if he sees a cow with an enlarged, hard udder, not painful, and that udder gives milk which appears healthy, which seems to be milk, then there is a great suspicion that it is a case of tuberculosis. If a veterinary surgeon sees such a cow, after a lapse of a month, giving milk much altered, then he ought to ask for the history of the animal, and in most cases he will be told that weeks ago there was a swelling of the udder, but no alteration of the milk, and when he gets this history he may be quite sure that it is a case of tuberculosis. Of course, to be perfectly sure, he ought to examine the milk under the microscope, because if he has a flocculency in the milk under the microscope it is probable that tubercle bacilli will be found. It is not always necessary to use the harpoon, as my friend Professor Nocard recommended a moment or two ago. The use of the harpoon may be very good, but I am sure that most owners of cattle will object to it. Sometimes by its use an inflammation in the udder will be produced. Another matter I wish to speak upon is tuberculosis of the uterus, which I am sure is a very common and very dangerous form of tuberculosis. If a cow discharges putrid matter from the vagina, and if some months before it had cast a calf, then there is great suspicion that it is a case of tuberculosis. Sometimes it happens that the disease begins during gestation, and then, of course, the discharge will appear immediately after the birth; but in some cases it develops itself slowly after the birth of a calf, and if a discharge is observed to begin slowly and go on developing for some months after the birth, then there is every suspicion that it is a case of tuberculosis. Then there is the examination per rectum; there is rectal exploration and vaginal exploration. Many years ago I called attention to this point in a text book on veterinary surgery, but I believe it is not very well known, and I want, therefore, to detain you for a moment on the matter. If you examine from the rectum a case of suspected tuberculosis in the womb, in many cases you will find first tuberculosis in the tubes. You find in the fore part of the uterus on both sides a tumour as large as half a hand, a tumour which has grown slowly, and if you find such a tumour you can be sure it is a case of tuberculosis. It very often happens that the tuberculosis begins in the tubes and afterwards extends to the uterus, or at least is very slowly developed in the uterus at the time when there are tumours in the tubes; afterwards you will discover the uterus to be enlarged and hard, and that is evidence of tuberculosis. It very often happens also that you have tuberculosis in the channels on the under side of the vagina. These small canals are usually not to be found at all, but in many cases of tuberculosis, if you put your hand into the vagina, you will find the under side of the vaginal tube much enlarged; you will find growths like thin fingers,

which are larger close to the uterus and thin at the other end. I know personally that in many cases you may be able to suspect or diagnose the disease in this way. If you have a suspicion, of course it is very easy to take some of the discharge and examine it under the microscope, but the chief thing is that the veterinary surgeon should have his suspicion raised. As long as he has no suspicion, he will not make any examination, and therefore may fail to find that the disease is present.

Herr MALM, of Norway: Amongst the subjects for discussion at this important Congress is the question: "What exact statistics are there to show the certainty or otherwise of the tuberculin test, and by what means may the application of this test toward the eradication of tuberculosis be best secured?" I imagine it may be of interest to submit the results of some observations I have personally made and carefully recorded at my laboratory in Christiania, during the course of several years. I have not paid any attention to the tests with tuberculin publicly carried on in Norway since 1895. Up to the end of 1900, 97,709 animals have been tested, and of these 6·99 per cent. have shown reaction; the number of tested herds was 9,205, of which 2,122, or 23·05 per cent., have possessed reacting animals. Although a large number of these animals which have given reaction have been examined after being slaughtered, and although in by far the greater number of these slaughtered animals tubercular lesions are said to have been found, I have nevertheless refrained from putting forward any calculation based on the observations, as I have not personally examined the slaughtered animals, and cannot therefore guarantee the accuracy of the statistics as regards the diagnostic value of tuberculin. I confine myself to the experiments which have been made at my laboratory since 1891. Of 51 head of cattle, 37 have been subjected to trials with tuberculin in such a manner as to form a basis for accurate statistics. Amongst them are, however, several animals that had been previously tested, and having shown doubtful reaction were purchased for further trials.

I append a short tabular description of all the animals divided into three groups. Group I. contains those cases which reacted for tuberculin and in which the diagnosis was subsequently confirmed by dissection; Group II. those in which there was no reaction and in which dissection failed to detect tubercular lesions; and Group III., those in which, although there certainly was reaction, or in which reaction was doubtful, no tuberculosis was found on dissection. A fourth group should consist of those cases in which there has been no reaction, but in which tuberculosis has appeared on dissection, but I have no instance of this in my statistics. It should be observed that a temperature over 39·6° C. is accounted as reaction when the animal was not feverish before the injection. The tuberculin employed is the ordinary kind, produced by Koch's old method; since 1891 I have prepared it myself, and its efficiency is always tested before making use of it for these records upon tuberculous guinea-pigs. Its toxical strength is such as to kill six to eight week old tuberculous guinea-pigs in five to eight hours, when the dose

administered is 20 to 30 centigrammes. I have also made occasional experiments with what is called Koch's new tuberculin, which, in doses of up to 1 cubic centimetre, has never produced any reaction, and therefore will not be further mentioned here, and also with various other preparations produced either from Koch's old tuberculin or of virulent bacilli by extraction, centrifugation and precipitation, which preparations have all been found toxical for tuberculous guinea-pigs and productive of reaction in tuberculous cattle. I have further in several instances tried a tuberculin prepared from cultures of avian tuberculosis, but this tuberculin has never caused reaction. I add moreover an experiment with injection on a large Yorkshire pig which showed reaction and was found to be tuberculous.

The temperature has been taken, usually, every hour, in some cases only every second hour after injection and up to the twenty-fourth hour. When not otherwise stated, the injections have been subcutaneous and the dose half a gramme diluted with sterile water.

Some of the experiments have been made for the purpose of finding out if tuberculin has had a curative effect, but I have in no case perceived any modifying influence on the tubercular lesions by repeated injections—neither after the ordinary tuberculin, nor after Koch's new tuberculin, nor after other toxical extracts.

It will be observed that twenty head of tuberculous cattle and one tuberculous pig have been tested and have shown reaction (Group I.), twelve head of non-tuberculous cattle, some healthy, some suffering from other disease than tuberculosis, and which have not shown reaction (Group II.); thus, together, thirty-three animals in which the tuberculin has given a correct result.

In five instances, the tuberculin has caused reaction, although diligent and careful search on dissection has failed to discover that the animals were tuberculous (Group III). It must however be remarked that except in one instance (No. 36) the reaction has in these cases neither been pronounced nor characteristic; but, on the contrary, doubtful. This instance was the first and only one that I have met with in which I would have asserted from the reaction that the animal was tuberculous, but which dissection negatived. The spine and bones were, however, not examined, and there remains therefore the possibility that there might have been a tuberculous grain somewhere or other in some deep gland, which had escaped my notice.

Several of the experiments have been undertaken in order to ascertain to what extent the power of becoming tolerant to tuberculin exists in various cases. It will be observed that the greatest difference is found in individual animals. Several of the tuberculous beasts (Nos. 1, 2, 4, 8, 9, 11, 12, 17, 18, 19 and 20) clearly evince their insusceptibility after a certain point for the fever—producing reaction of the tuberculin even for large doses of up to 20 grammes (No. 8); but this insusceptibility is unreliable and short-lived, and it can be interrupted either by large doses of the same tuberculin or by employing tuberculin of greater toxical strength. It is, however, quite

remarkable that amongst the eighteen animals which were subjected to more than one injection of tuberculin, no less than thirteen show signs of becoming tolerant—that is, in 66·6 per cent.

On the other hand, there appear to be individual animals which do not seem able to become habituated.

I must, however, strongly point out that when judging the diagnostic power of tuberculin it must be remembered that it will not do to build upon statistics based on tests from every-day practice or in quarantine stations, where temperatures have only been taken perhaps every three hours, or at most every second hour from the twelfth hour after injection. It will be seen, from several of my experiments, that the maximum temperature was before the twelfth hour, and even in the sixth or seventh.

If the injection is intravenous the fever sets in between the second and third hour, and attains its maximum in the fourth or fifth. I have, however, recorded several instances in which the temperature-curve after a subcutaneous injection shows a distinct reaction which is completed within the twelfth hour, and in which normal temperature has returned in the twelfth hour. Such cases would in ordinary practice be put down as not showing reaction, but as being found to be tuberculous when slaughtered, and thus the reliability of the tuberculin test would be brought into discredit.

According to the well-known comparative tables of Eber in 1895, of 563 cases under supervision, the tuberculin proved unreliable in 13·14 per cent.

Bang states 9·7 per cent. on 515 cases under observation.

Voges in 1897 mentions that he compared 7327 cases proved by dissection and found 204 wrongly diagnosed, or 2·78 per cent.

Nocard has given a table of 124 cases, in which only one has not been correct.

The experiments of Rokl, Schütz, and Lydtin show a large percentage of failures, and Kühnau, in Hamburg, returns the percentage at the quarantine examination there as 12 per cent.

It might also appear, on a superficial glance at the results of my accurate observations, that of 38 animals the tuberculin gave an incorrect result in five cases, or in 13·16 per cent., but in reality there is only one case, No. 36, in which there has been marked reaction, and in which subsequent dissection failed to find tuberculosis. One may therefore surmise that the fault in this instance is mine and not that of the tuberculin, and that I have been unable to detect the tuberculous focus. Of the 38 cases there is however not a single one in which a tuberculous animal has failed to give reaction, and that is after all the most important principle and the salient point.

No. 18 refers to a calf born in the cow-house of the laboratory, and there placed together with some tuberculous animals, for the purpose of observing if and when it became infected. It will be seen that the calf must have become infected after being 8½ months in the stable. Dissection also showed fresh tuberculosis in the lungs and in a mediastinal gland where also there were already calcareous grains.

When I therefore have ventured to put forward the result of my observations in this very limited number of cases it is because I have observed them most closely and recorded them with the utmost care, and because they enable me to reply to the question under Division IV., Letter B, as follows:—

1. The tuberculin employed as a diagnostic should be a tuberculin produced on the same principles as that of Koch in 1890.

Its strength should be uniform, and should be of such toxical strength as to kill with certainty six to eight week old tuberculous guinea-pigs within eight hours, in dose of 20 to 30 centigrammes subcutaneously administered.

2. Such a tuberculin produces unfailingly in tuberculous animals a febrile reaction of a distinct type. It is recommended that large doses should be given, even to young animals; there is no danger or inconvenience in always employing doses of half to one gramme.

3. Tuberculin may at times also produce fever in non-tuberculous animals, but this fever is not typical, and does not attain such a degree as in tuberculous cases.

4. If typical tuberculous reaction appears in an apparently healthy animal, and on dissection nothing tuberculous is found, it is the fault of the dissector.

5. To determine with certainty whether reaction exists or not, it is necessary to take the temperature from the sixth to the twentieth hour after injecting hourly, or at least every second hour.

6. The fact that tuberculin in a few isolated instances produces fever in non-tuberculous animals, is of no importance when the question is its usefulness as a means to eradicate tuberculosis, and in this respect it is decisive, as tuberculin invariably causes reaction in tuberculous animals.

7. The foregoing refers to animals treated for the first time. Most animals become more or less accustomed to the tuberculin, but this is uncertain and unreliable and can be overcome by the use of an increased dose or a tuberculin of greater toxical strength.

If the question comprises that of the manner in which the tuberculin should be employed in the practical struggle against the cattle-tuberculosis, I must decline to express an opinion.

The practical combating of tuberculosis concerns administrative economical and social spheres, and the answer must vary in different countries according to the prevalence of the disease and its extent, the system of farming and cattle trade, and the pecuniary means available.

In the case of my own country I must refer to my annually published reports on the veterinary service in Norway and to the account I contributed in 1898 and 1899 to the "Revue de la tuberculose."

It is easy to agree as to the theoretic ideal goal and the desirable means, but the practical carrying out of the latter is, in each individual country, a more or less delicate problem which must be solved by the authorities themselves.

17	1	Cow 9 years	3/4/1900	0·50	38·6	**40·3**	15	
	2		11/4/1900	0·50	38·0	**40·5**	14	
	3		25/4/1900	0·50	38·2	38·7		
	4		2/5/1900	0·50	38·0	38·4		
	5		6/5/1900	0·10 toxin	38·3	**40·3**	12	
	6		15/5/1900	0·20 toxin	38·4	38·4		
	7		25/5/1900	2·50 ordinary tuberculin	38·2	38·6		
	8		31/5/1900	0·10 toxin	37·9	38·1		
	9		15/6/1900	2·50 tuberculin	38·6	38·5		
	10		21/6/1900	2·50 tuberculin	38·6	38·5		
	11		10/7/1900	2·50 tuberculin	38·4	38·4		
	12		17/7/1900	0·10 toxin	39·0	**39·7**	9	
	13		28/7/1900	2·50 tuberculin	38·6	38·7		
	14		9/8/1900	2·50 tuberculin	38·4	38·5		
	15		25/9/1900	2·50 tuberculin	38·3	38·5		Slaughtered 5/12/'00. Tuberculosis only in the mediastinal glands.
	16		30/10/1900	3·00 tuberculin	38·3	38·5		
	17		9/11/1900	0·10 toxin	38·4	38·5		
18	1	Calf born 12/4/1900 by Cow No. 17.	2/5/1900	0·20 tuberculin	38·2	38·7		
	2		28/7/1900	0·50	39·0	38·9		
	3		25/9/1900	0·50	38·7	38·7		
	4		8/1/1901	0·50	38·1	38·3		
	5		16/1/1901	0·50	38·6	38·9		
	6		23/1/1901	1·00	38·6	38·7		
	7		31/1/1901	1·00	38·3	38·7		
	8		8/2/1901	1·00	38·5	**40·1**	8	
	9		15/2/1901	1·00	38·7	39·0		
	10		26/2/1901	1·50	38·7	39·0		
	11		8/3/1901	2·00	38·6	39·2		
	12		25/3/1901	2·00	38·4	**41·4**	10	Slaughtered 8/6/'01. A fresh little tubercle in the right lung, and a conglomerate of tubercular.
	13		3/4/1901	2·00	38·5	39·5		
	14		11/4/1901	2·00	38·5	39·3		
	15		20/4/1901	5·00	38·2	38·8		
	16		6/6/1901	20 ccm. intravenous	38·7	**41·0**	5	

19	1	Cow 8 years	30/5/1900	0·50	39·4	**40·7**	12	
	2		15/6/1900	0·50	38·7	39·5		
	3		21/6/1900	0·50	38·4	38·6		
	4		25/6/1900	2·50	38·2	39·1		
	5		3/7/1900	{0·10 toxin}	38·7	39·1		
	6		10/7/1900	{0·10 toxin}	38·4	**40·1**	8	
	7		17/7/1900	{0·10 toxin}	38·8	38·7		
	8		9/8/1900	{2·50 tuberculin}	38·2	**40·3**	10	
	9		25/9/1900	2·50	38·4	**40·6**	14	
	10		20/10/1900	1·50	38·1	39·1		
	11		9/11/1900	2·00	38·5	**40·2**	6	
	12		20/11/1900	2·00	38·3	38·7		
	13		8/1/1901	2·00	38·2	38·6		
	14		16/1/1901	2·50	38·6	**40·2**	8	
	15		23/1/1901	2·50	38·3	**40·0**	8	
	16		31/1/1901	2·50	38·4	**39·8**	10	
	17		8/2/1901	2·50	38·7	39·6	8	
	18		15/2/1901	3·00	38·1	**39·7**	8	
	19		26/2/1901	3·00	38·3	**40·4**	7	
	20		8/3/1901	3·00	38·5	39·4		
	21		25/3/1901	3·00	38·5	**40·2**	8	
	22		3/4/1901	3·00	38·5	**39·8**	7	Slaughtered 26/4/'01. Tuberculosis in pleura - peritoneum in high degree; caverns in the lungs.
	23		11/4/1901	3·00	38·4	**39·7**	8	
	24		20/4/1901	10·00	38·5	**40·7**	8	
20	1	Cow 8 years	9/3/1901	0·50	·59·0	**40·7**	8	
	2		25/3/1901	0·50	38·4	**40·4**	8	
	3		3/4/1901	0·50	38·4	**40·1**	12	29/4/1901. Only a little tubercle in a retropharyngeal gland.
	4		27/4/1901	0·50	38·2	38·7	8	
21		{Swine 1½ years}	3/12/1891	0·50	38·9	**39·8**	14	5/12/1891. Tubercle in the pharyngeal glands.

Mr. WILLIAM REID, of the London Central Market, said: We have all heard with very great pleasure Professor Dewar's very able paper on tuberculosis. There is one question which I think vitally affects the meat trade in the United Kingdom, and I should like to ask and have a direct answer from Professor Dewar on the question at the present time, although I understand there are some resolutions to come before the meeting some time during the week that will affect this question. My question is: Would it be possible, even for a professor, to detect tuberculosis in an animal before emaciation has set in, by simply looking at it in a yard, a field, or a market?

The CHAIRMAN replied: Professor Dewar will have to make a reply in concluding this discussion, and that and any other questions had better be dealt with at that time.

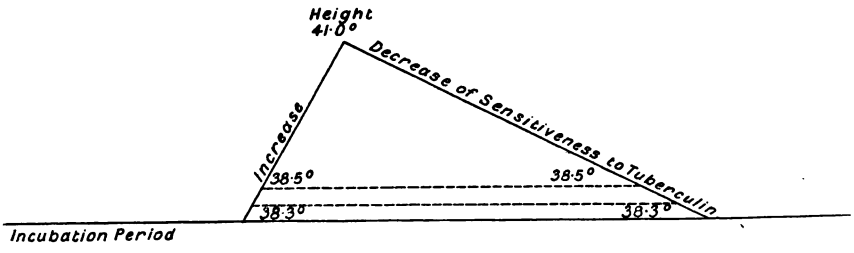
Professor SCHÜTZ, of Berlin, said: Gentlemen,—Cows which are tuberculous are not infrequently affected at the same time with diseased conditions of the udder, and a statement as to whether the alteration is of a tuberculous nature or not is not so easy to make as one may imagine.

In more modern times the opinion is that a microscopic examination of the milk drawn from the tuberculous udder is enough to establish the tuberculous nature of the alteration. These tests should be used only to form a groundwork, and the sediment of the cream should be searched for the presence of tubercle bacilli. I do not consider it even then absolutely established, after the result of my examination. The mere microscopical examination does not go far enough to be able to distinguish the tubercle bacilli from the other acid-ferment bacilli which are frequently found in milk; even the anatomical examination of such udders does not often afford a more certain decision. We have several times been able to find in udders, declared to be tuberculous, the results of a chronic inflammation of the udder, but no specific alteration—that is to say, none peculiar to tuberculosis; and in the milk which was left in the spaces of the tissue of the udder and in the milk channels bacilli were present resembling, it is true, the tubercle bacilli, but which, as the further examination demonstrated, were not true tubercle bacilli. In my opinion a surer result can only be obtained by inoculation with some of the milk or a part of the udder. This inoculation must be carried out with guinea-pigs, which, it is well known, sicken with all appearance of tuberculosis after the inoculation with the milk or a piece of the udder, if it contains bovine tuberculosis.

With regard to the tuberculin test for cattle, I must now, if you will allow me, give you the following details. When a cow has shown signs of having tubercle bacilli, a certain time generally elapses before a reaction follows the injection of the tuberculin. This time, the length of which varies in accordance with the length of time taken by the development of the tuberculous stages, can be likened to the incubative period of other infectious diseases. When once the sensitiveness to tuberculin has set in, it rises rapidly to reach a certain

height, after which it generally falls and ceases altogether. In the accompanying diagram it is attempted to represent the incubation period, the quick rise and the gradual fall of the sensitiveness. If the sensitiveness to tuberculin ceases, then one concludes that the sick cow has formed so much tuberculin itself that a further injection of tuberculin could not produce a reaction in the animal. Here it must be observed that the above symptoms only occur when it is always the same quantity of tuberculin which is injected in the cattle.

Consequently every reaction which is produced amongst the cattle after the injection of tuberculin is caused by tuberculosis; and it cannot be asserted that a cow is tuberculous if the temperature after the injection of tuberculin



rises, for instance, to 40°, or if the difference between the average temperature before the injection and the highest temperature after the same is 1·5° or 1°. As regards the increase or the decrease respectively of the sensitiveness to the tuberculin, slight rises of temperature, such as 38·3°, may just as well be reactions as 41°, only one is not then in a position to recognise the small rise of temperature as a reaction, because under normal circumstances such rises of temperature often occur in the same manner, and are on this account not distinguishable from those which result from tuberculin injection. But when the temperature rises one or more degrees, it can be attributed to the injection, because under normal conditions this sort of rise of temperature is not observed at all in cattle, or very seldom. A further difficulty in the diagnosis of tuberculosis lies in the fact that tuberculin administered once produces in cattle long-enduring immunity, so that, on a second injection of the tuberculin, no reaction follows.

In tuberculous human beings the matter is somewhat different. With them, after the first injection of tuberculin, no immunity from a further one results, and every time after the injection of tuberculin a rise of temperature, even if it is only 0·3° or 0·5°, gives ground for the suspicion of tuberculosis.

Dr. BANG replied: I am dead against Professor Schütz. He said it is not possible to make a diagnosis of tuberculosis of the udder by examination of the milk. I say it is possible. In Denmark we kill all cows affected with tuberculosis of the udder, and in all such cases the sample of milk from the diseased cow is examined in my laboratory, and if we find tuberculosis the cow is killed. During a year or a little more I have examined—in all

cases where the cow has been killed—the udder, in order to convince myself that the microscopic diagnosis of tubercular bacilli in the milk was right, and it was right. Pieces of the udder sent to me corresponded accurately with the diagnosis of the milk. Perhaps 1 per cent. was not right. Practically I say it is possible to make a diagnosis by examination of the milk, and that, in my opinion, is the chief point. Therefore I have to object to the remarks of my celebrated colleague Professor Schütz.

Professor McFadyean said: I am sure we are all very much indebted to Professor Dewar for the admirable paper he has provided to serve as a basis for our discussion, and we are also immensely indebted to those distinguished members of the veterinary profession from abroad who have come here to give us the benefit of their great experience. There are in Professor Dewar's paper very few points with which I do not find myself in agreement. I am not sure that his paper is not perhaps calculated to give an impression that our powers of diagnosis, without resort to tuberculin or bacteriological examination, are not greater than they really are. It is a fact that if we were called upon to diagnose tuberculosis only in the circumstances in which the human physician is asked to make a diagnosis, that is to say, when the animal is already very ill, we could in a large proportion of cases make a very probable diagnosis, and in a considerable number we could, I think, make a certain diagnosis; but we ought to recognise that if we are to deal successfully with tuberculosis in the direction of reducing its prevalence or stamping it out, it becomes necessary to make an early diagnosis, and I think everybody is prepared to admit that there is no other method than the tuberculin test by which one can, in 80 per cent. of the cases of tuberculosis in existence at any given moment, arrive at any conclusion at all. It is true that in cases in which there is an extraordinary lesion, such as an enlarged lymphatic gland in the region of the throat, or a tuberculous quarter of the udder, one may be able to make a positive diagnosis by the method which was referred to by Prof. Nocard, namely, the method of harpooning the diseased part. Now, I merely want to observe with reference to this method of diagnosis that, like many other things, it is not new. I am not sure whether Prof. Nocard is aware that it is not new, but if that is his impression he has overlooked the fact that that method of diagnosis was dealt with in my report to the first Royal Commission on Tuberculosis eight years ago, and among the series of slides which I exhibited last night there was one showing a number of the tubercle bacilli which I removed from the indurated quarter of a living cow. I really do not attach very much importance to the question of priority with regard to the discovery of the advantages of that method of diagnosis, because I do not think it is a matter of great practical importance. I do not know how one may be able to proceed in France—we have a proverb which says that they manage these things better in France—but I know in this country we have not the power to go about inserting harpoons and trocars into the udders of living cows. The owner has a legal right to object, and you may take it as

perfectly certain that he will object. In my own experience I find that they are perfectly aware of their right to object, and always refuse permission to insert a trocar into the udder of the living cow. So that the instance in which I was able to do it was a case in which I had first to buy the cow, and then make the diagnosis. There is just one other thing I should like to be allowed to refer to, and that is, as to what is the precise value of the tuberculin test, or what are the proportions of the possibility of error in connection with it. I am not prepared to go anything like so far as the Veterinary Inspector to the Board of Public Health of Victoria, who has been quoted by Prof. Dewar, nor am I prepared to go as far as Herr Malm. I think we are not justified in saying that every animal that is the subject of tuberculosis will give a distinct reaction when it is tested with good tuberculin. I have myself made a good many experiments with what I think we might take to be good tuberculin of Koch's own manufacture. In a proportion of these—not a very large proportion, but still in a certain proportion—animals that were immediately afterwards, on slaughtering, proved to be tuberculous had not given any reaction at all, that is to say, they had not given a reaction that amounted to one degree. But apart from that, the experiments which have recently been carried out simultaneously but independently in France and England, referred to by Professor Nocard, make it quite unjustifiable for anybody to say that every animal which is the subject of tuberculosis will give a distinct reaction to tuberculin. The English experiments, as many of you undoubtedly know, were carried out at the instigation of the Royal Agricultural Society. The cattle were infected in various ways with tubercle bacilli, and then they were tested at intervals in order to see how soon they would react. The French experiments were exactly on the same lines, and some of the results were very disconcerting, because we found out that for a period which might be as long as fifty days, these animals, infected and having distinct lesions, from the end of the first week or fortnight for fifty days after infection would not in some cases react. There is every reason to believe that that is so in practice—that the interval which elapses between the actual moment of the entrance of tubercle bacilli into the body and the earliest moment at which you can get a reaction, is sometimes considerable. That I regard as a distinct defect in tuberculin with which we have to reckon. It is a practical mistake, I think, for anyone to exaggerate the value of tuberculin. I think we ought to admit it is far the best method of diagnosis that we know; it surpasses all other methods combined of diagnosis for general purposes, and when we have to make an early diagnosis, but it is not infallible.

Professor HUTYRA, of Budapest, said: I believe that the difference in the results of the tuberculin injections is partly due to the fact that the reactions are criticised on an unequal basis, and I think that, in the interests of the public, an agreement as regards the principles of the decision of the conditions of the temperature is very much to be desired. My view is not so much that the rising of the temperature in comparison with the heat of the

body before the injection is of importance, but that the highest temperature reached after the injection is so. It is then really a question whether the animal in consequence of the injection is feverish or not; if it is discovered without the chart, then the reaction must be positive, however much the earlier temperature has risen. With full-grown cattle a rise of temperature of 40° degrees or over (if otherwise the temperature chart shows the typical form) is to be considered as a positive reaction. My own experiments have shown that the tuberculin reaction, if it is judged from this point of view, gives a corresponding result in 98 per cent. of the cases to that of the observations of the other speakers in this Section; a noticeable organic reaction appearing at the same time as a rise of the temperature to 39·5° or to 39·9° C. indicates the existence of tuberculosis.

Professor THOMASSEN, of Utrecht, particularly drew attention to "The Receptivity of Bovine Animals for the Bacillus of Human Tuberculosis," as follows:—

For a long time people refused to recognise that tuberculous lesions in bovines bore the same characteristics as those in men. Comparative pathologists especially, with Virchow at their head, held the view that the "grapes" of cattle was absolutely distinct from human tuberculosis.

It was not until 1882 that the discovery of the Koch bacillus and its invariable presence in specific lesions of all kinds finally convinced them. However, during the period dating from Villemin's magnificent discovery up to that of Koch (1865–1882), numbers of experimenters were striving to prove the identity of the two forms of tuberculosis.

To prove this it was necessary that the virus should be taken from one species and developed in the other, and naturally it was only a question of conveying the infection from man to animals. If one were successful in this the converse might be assumed as possible.

It was Chauveau, of the Veterinary College at Lyons, who made the first attempts in 1868.

Three heifers, which were made to swallow infectious matter from human lesions, became tuberculous. These lesions resembled in character those of animals which had been fed on the products of bovine tuberculosis.

In one case the human virus was intravenously introduced into an ox, and after twenty-nine days it was found that the injection had already caused the commencement and formation of some interesting lesions, all situated in the chest. The hypodermic injection of a tuberculous emulsion derived from a human source set up a localised tuberculosis with lesions mainly situated in the lymphatic gland nearest to the place of injection.

Chauveau ultimately concluded that the virus of human tuberculosis acts upon bovines in exactly the same way as virus which is derived from one of their own species.

Kitt produced acute tuberculosis and death in forty-six days by inoculation with 20 grammes of gastric juice from the scrofulous glands of a man.

Bollinger, in 1879, injected sputum into the peritoneum of a calf three months old, and in seven months this produced a typical "grapes" of the abdomen.

Crookshank also inoculated a calf in the peritoneum, and found, after forty-two days, miliary tubercles in the liver and lungs. The animal had succumbed to pyæmia.

Klebs inoculated a calf in the peritoneum with human tuberculous products, and three months afterwards found on the omentum and part of the stomach a mass of tubercles, calcified in the centre and displaying the histological features of bovine tuberculosis. There were also miliary tubercles in the mesenteric lymphatic glands, and some in the liver and spleen.

Siedamgrotsky, in 1874, administered human tuberculous material to four sheep in their food, but failed to produce tuberculosis in these animals. He obtained, however, positive results with products taken from cattle "grapes."

The results obtained by the few experiments just related, which date from a period prior to Koch's discovery, nevertheless help to support the theory that bovine and human tuberculosis are one and the same thing.

When it was ascertained that the bacillus was invariably present in specific lesions in both species, the last objectors among the comparative pathologists gave way.

But the experiments of recent years, which have aimed at transmitting the disease from humans to bovines by means of pure cultures, have in a large majority of reported cases given negative results. The reason for this needs investigation, as it gives rise to false deductions which hinder the profession in matters of hygiene.

The Inoculation of Bovines with Pure Cultures of the Human Bacillus.

The first results we find mentioned are those obtained by Theobald Smith, who begins by asserting that there are differences—both morphological and biological differences—between the human and bovine bacillus. Then, from the pathologists' point of view, the bacillus obtained from bovine tuberculosis is more deadly for experiments on animals, causing death sooner and producing lesions which are more extended and richer in bacilli. Smith inoculated eleven cattle, five with the bacillus of bovine tuberculosis (grapes), and six with the bacillus from human sputum. Of the first five, two succumbed to miliary tuberculosis, one showed (when slaughtered two months later) typical nodules, and two others also exhibited tuberculous lesions.

The six animals inoculated with the human bacillus, when slaughtered at the end of two months, showed only slight local lesions, these being situated in the place of injection and corresponding lymphatic glands. ("Journal of Experimental Medicine," 1898.)

Dr. Frottingham experimented on four calves with cultures from man, and upon post-mortem he found in three animals tuberculous symptoms limited to

the place of inoculation. He did not succeed in producing a case of *general* infection; all the animals reacted to tuberculin five weeks later. He arrived at the conclusion *that these experiments can scarcely be said to prove that a calf can be infected with the tuberculous bacillus from man.*

Richard Gaiser ("Arbeiten auf dem Gebiete der Patholanatomie," B. II., 1899) experimented with human bacillus which had proved very fatal to guinea-pigs and rabbits. A calf inoculated behind the eye and beneath the skin of the flank showed, when killed three months after the injection, no trace of tuberculosis. All symptoms of irritation in the eye had disappeared at the end of a fortnight; there remained merely for some time on the iris a small yellowish focus, which disappeared slowly, as did also a slight swelling on the flank.

Another calf inoculated with culture from a cow, the bacillus of which had passed four times through rabbits, developed general tuberculosis.

These are the dubious results which are quoted by some of Koch's opposers as demonstrating the non-identity of the two forms of tuberculosis; but this is such an important question, from the hygienic point of view, with reference to the dangers of the consumption of milk and meat from tuberculous animals, that I was led to make some experiments, in the hope of clearing up certain points not yet elucidated, the results of which experiments I beg to communicate as follows:—

In March, 1899, I experimented on two calves, one aged four weeks, and the other eight weeks. They were first of all subjected to the tuberculin test, and neither showed any reaction after an injection of 10 cm. of tuberculin. They were fed with milk from a cow which had also been tested with tuberculin without producing any reaction.

I. For the first calf, aged eight weeks, we used a bacillus cultivated on glycerinised potato taken from the exudate of a child who had died from tuberculous meningitis. To rabbits and guinea-pigs it had proved extremely fatal. On the 21st of April a rich culture, diluted with sterilised pulp, was injected into the abdominal cavity.

For some days after the injection the animal showed no symptoms of distress, the temperature remaining normal. We noted besides:—

May 12th	a mean temperature of	38·8° C.
,, 13th	,, ,,	38·6° C.
,, 14th	,, ,,	38·4° C.

On the 15th of May 0·5 grammes of tuberculin were injected about eleven o'clock in the evening. The next day the thermometer recorded the following temperature:—

May 15th, 8 A.M.	39·7° C.
,, 10 ,, ...	39·9° C.
,, 12 noon	40·2° C.
,, 2 P.M.	40·5° C.
,, 4 ,, ...	40·6° C.
,, 6 ,, ...	40·0° C.
May 16th, 10 A.M.	38·8° C.

We had therefore ascertained a reaction of 2° C., which proved the existence of either a local or general tuberculosis caused by the inoculation.

The only symptom shown afterwards by the animal was that its hair was less glossy and its skin somewhat "hide-bound." About *two months* after inoculation the calf was slaughtered, and at the post-mortem the most minute examination revealed no trace of tuberculosis.

II. The other calf, aged four weeks, was inoculated with a culture on glycerinised potato of a bacillus taken from human tuberculous arthritis which had caused generalised tuberculosis in guinea-pigs and rabbits. The tuberculin test had given a negative result.

On the 22nd of April inoculation took place behind the left eyeball. A few days after the animal was attacked with profuse diarrhœa (white scour), which weakened it considerably, and necessitated for some days a serious treatment with tannalbin, and then it developed paraplegia, so that it could no longer stand; however, it retained sufficient appetite to keep it alive.

After the second, the cornea was affected and became opaque, owing to keratitis, which prevented us from following the course of the disease in the back part of the eye, and especially on the iris. Ophthalmia developed, and the eyeballs began to atrophy considerably.

On the 14th of May the calf was subjected to the tuberculin test. During the three days before the injection the mean temperature had been 39° C. The day following the inoculation with tuberculin we had:—

May 15th,	8 A.M.	39·5° C.
,,	10 ,,	39·6° C.
,,	12 noon	39·1° C.
,,	2 P.M.	39·1° C.
,,	4 ,,	39·0° C.
,,	6 ,,	38·9° C.

This reaction of 0·6° C. made us suspect the existence of tuberculous lesions. The animal wasted away little by little, till we were obliged to have it killed on the 27th of May, that is to say, about five weeks after the experimental inoculation. At the post-mortem we found a well-distributed tuberculosis. The greater part of the eye had been destroyed, and especially on the iris numerous tubercles had formed, containing masses of bacilli. All the glands from the left side of the head down the neck to the bronchial lymphatics were hypertrophied; the parotid, pharyngitic and cervical showing tubercles not yet caseified; in the sections taken many bacilli were visible.

The apices of the lungs were specially affected on both sides. In the pulmonary tissue there were recent and non-caseating miliary tubercles, sections of which disclosed the presence of numerous bacilli. Several nodules, about the size of a pea and of a fair consistency, were present. In the apices of the lungs we found immediately under the pleura some caseous foci, averaging about the size of a nut, containing a yellow coagulated material. In a cover-glass preparation of the contents we were able to discover

bacilli which, stained according to the Ziehl-Gabbet method, lost their red colour. It is therefore evident that we had succeeded in this case in causing an extension of the tuberculosis from the eye to the pulmonary lymphatic glands. We observed, in addition, that the local reaction in the eye was more intense after the injection with the cultivated bacilli than after inoculation with tuberculous matter as practised by Cohnheim and Baumgarten on rabbits.

III. A strong, healthy heifer, aged about fifteen months, was subjected in November, 1889, to the tuberculin test. The average temperature before injection was 39·9° C., and after the application of 25 c.cm. an insignificant reaction of 0·5° C. took place, so the animal might be considered to be absolutely free from tuberculosis. On the first of December an intra-tracheal injection was made of a culture taken from a human kidney. No change took place in its general condition, nor was there any temperature reaction after the inoculation. The animal had throughout an excellent appetite and gained considerably in weight. On the 13th of February, 1900, that is to say, two and a half months after inoculation, the animal was again injected with tuberculin. Before the injection the average temperature had been 38·8° C.; 30 cm. of tuberculin were injected at 10.30 P.M.

February 14th, the temperature ranged as follows:—

7 A.M.	39°
8 ,, ...	39·3°
9 ,, ...	38·1°
11 ,, ...	39°
12.30 P.M.	39·2°
2 P.M.	39·5°
5 ,, ...	39·3°

There was, therefore, a reaction of 1° C., which justified us in considering the animal free from tuberculosis.

On the 16th of February the same animal received one culture of human bacillus in the peritoneum and another in the thoracic cavity. An incision was made in the skin, and the tube was inserted between the eighth and ninth ribs and in the left flank, besides a small portion in the muscular tissue. The next day the temperature went up to 40·3° C., and the general condition of the animal denoted slight fever; the second day the temperature fell again to 38·2° C. A fortnight after the operation a tumour as big as a fist developed between the muscles of the flank; the tumour was confined to one spot, was resistant, and could be displaced with the finger; at the end of a week it was probed. Enclosed in a hard, tough, fibrous membrane, we found a yellowish puriform matter which, when cultivated, was found to be full of Koch's bacilli. After emptying the contents we left the wound to itself and it slowly cicatrised.

The swelling gradually disappeared. The heifer lived till April, 1901, or fourteen months after the second inoculation. Being well nourished, it was sold to the butchers, having served meantime for other experiments, the resection of the recurrent nerve being one of them.

The most minute examination failed to disclose the smallest trace of any tuberculous lesion. In the right flank we simply discovered a diffuse fibrous induration.

IV. A pregnant heifer, aged one and a half years, which only reacted 0·9° C. to tuberculin, received in the back part of the right eye a portion of the culture from a human kidney. The next day intense inflammation of the eye set in, and went on increasing so much that at the end of the third day, through the inflamed cornea, one could detect a quantity of pus in the back part of the eye. The appetite diminished and the animal seemed to be in pain, but the temperature remained normal. Later, when the general condition grew worse, the temperature went up to 40·6° C. and kept about the same height until December 21st. The eyeball was double its usual size and protruded out of its socket at this time, so that the eyelids could not cover the cornea, which dried up in consequence and began to peel off.

Gradually the eyeball resumed its normal size, but the cornea was partly destroyed and remained opaque; the general health improved, appetite returned, and the animal gained in weight.

On February 13th it was subjected to the tuberculin test. Before injection the mean temperature was 39° C.

The day following the operation showed the following figures:—

Feb. 14th,	7 A.M.	39·5°
,,	8 ,,	40·3°
,,	9 ,,	40·1°
,,	11 ,,	40°
,,	12·30 P.M.	39·7°
,,	2 P.M.	40°
,,	3 ,,	39·7°
,,	6 ,,	39°

The maximum increase was reached ten hours after injection and was 1·3° C.

The animal at the same time showed symptoms of a general reaction—that is to say, it had little appetite, was languid and coughed a great deal; it almost seemed, too, as if the inflammation in the eye had increased. This reaction proved at least a local tuberculosis, that is to say, in the eye.

On May 15th the animal was slaughtered, and besides tuberculosis of the eye we found tubercles in one bronchial gland, but no microscopical examination was made.

Conclusions.—It follows from the experiments that it is difficult, but not impossible, to set up in the bovine species a generalised tuberculosis by means of pure cultures of bacilli obtained from the human subject. That the two diseases are identical still remains a firmly established truth, from which it follows that we must always take into account the danger of infection from cow to man, which, in my opinion, is more likely to happen than the reciprocal infection.

Contrary to Koch's opinion, the generally admitted higher virulence of bovine bacilli justifies us in exercising a strict supervision of the milk and flesh of tuberculous animals.

The success of experimental infection depends in large measure on the degree of resistance offered by the animal, as Nocard has suggested, and as is demonstrated by the second experiment.

It is desirable that numerous experiments may be carried out as soon as possible, and we do not doubt that the result will prove that the theory founded on the experiments of Schütz and Koch is erroneous, and the outcome of a premature conclusion.

Professor W. Owen Williams, of Edinburgh, here rose and made the following remarks: I do not desire to enter into the discussion as to the value of tuberculin, as has been done by some of our foreign associates, but I should like to make one or two remarks in connection with other subjects. The object of the Congress is to discuss how we can prevent tuberculosis from spreading in the human race, and the paper for the moment is the diagnosis of tuberculosis in animals during life. I fear if this paper be published without some little explanation, it may mislead the public into thinking that the ox tribe is the only tribe from which the human being has to fear any danger. There are other animals with which the human being is much more associated than the ox or the cow, namely, the horse, dog, cat, and bird, all of which are affected with tuberculosis, and these animals are in my opinion very often the conveyors of the disease to the human race. I simply want to draw the attention of those interested to the fact that other animals besides the ox have the disease and can convey the disease to man. In reference to the diagnosis of the disease, I should like to state that one thing is not sufficiently taken notice of, and that is the taking of the temperatures of the animals night and morning. Animals that have tuberculosis, when being subject to the tuberculin test, will show continuous variations in temperature both at morning and at night. Their temperatures are never equal; they rise and fall continuously, indicating intermittent fever. I recognise that there are two distinct forms of tuberculosis of the udder of the cow. One of these is a most insidious form that often goes on after an attack of cold, or what is commonly called "weed." The difference noticeable without resorting to tuberculin or without making a microscopic examination is that in an ordinary "weed," after the quarter has been enlarged, if it is non-specific, the swelling subsides and the quarter commences to shrink, and you have a thin quarter which is shorter than the other two or three quarters; but if the disease is a tubercular one, after the inflammation has apparently disappeared from the quarter, milk may be restored to a certain extent to that quarter, but the quarter never diminishes in size. It tends to increase in size, and these cases I have always found to be cases of tuberculosis of the udder. It was mentioned in connection with tuberculosis of other organs that sometimes there was a chronic

inflammation of the udders. A friend of mine related a number of years ago an extremely interesting outbreak of tuberculous mammitis in a herd of short-horns, and this was conveyed from cow to cow by means of a bull that had tuberculosis of the penis. I am a believer in the infallibility of tuberculin; I have never yet known it to fail in giving correct diagnoses.

Mr. POTTIE, of Paisley, said: I think the subject before us is a very simple one. It is this: is the old system of diagnosing tubercular disease as good as the use of tuberculin? I think if any gentleman brings any other ingredients to inject, we may give him a hearing; but at the present time, with the work the veterinary surgeons are now engaged in, these are the only two methods—either to use tuberculin or the ordinary means of detecting the disease by symptoms. For thirty years I have been a practical veterinary surgeon, and perhaps there is not a practical veterinary surgeon who has dissected more tuberculous animals than I have. We know that the public have a mind, and there are a vast number of people who will not speak out about the disease for fear of the public. I have never been able to understand that; whatever is true we scientific men must adhere to, although it may be against the idea of the public. I have studied this disease for a considerable time—in fact, all my life—and as a practical man I think the question is put very forcibly by Mr. Reid: How can we detect an animal, which has no symptoms of the disease apparently, with the ordinary method or with tuberculin? Which of them is the best? I, like other veterinary surgeons, hailed with pleasure the discovery of this tuberculin, and I never found a veterinary surgeon yet who objected to its use. Do we see in the writings of individuals that some veterinary surgeons have discarded it and have been spreading abroad something against it? Never. No veterinary surgeon has done so, even although it has failed in his hands. Let us keep to facts. If I am in a large practice amongst cattle, it will not do for me to go to my clients and say, "I have a remedy to detect this disease in your stock." If after applying the remedy the man comes and tells me that I have failed, he may say, "I have killed several cattle and not found a tubercle bacillus in them; but you said they reacted and that they were tuberculous—it has failed." Do you think such a thing as that will be kept quiet? Never. Do you think that will be useful to a man in a large practice? Never. He must have an article in some way that gives satisfaction to his clients. I appeal to the farmers and I appeal to the breeders. In Renfrewshire I could name three farmers that believe in it, but the whole of them, with those exceptions, are against it. Why is that? Is it because gentlemen have been going about saying anything against it? Never. It is because certain gentlemen had tuberculous cattle and have told others that it was a perfect farce. The practical veterinary surgeon and the professional veterinary surgeon are in antagonism. I admire the professors—I admire all our professors, and I do not want to say one word against them, but I say that when there is any

dispute between theory and practice the practical man must have it, because his experience is founded on facts. To take an example, we need not speak of tuberculosis in animals whose symptoms are apparent, but I may go to a cow which has no symptoms; I try my old way, and I will give you an instance from Liverpool. I will read you a note: "A farmer in one of the suburbs of Liverpool had twenty cows tested by the Liverpool Corporation. At first seven reacted. These seven were again tested, when only four reacted. Then the four were again tested, and only two reacted. The Corporation of Liverpool bought the two last-named and slaughtered them, and found them quite free from tuberculosis." If the tuberculin test proves faulty, and the ordinary test proves faulty, where are you? The question is then, practically, which of them is the best? I adopt the tuberculin test. My duty is to attend every week at a sale where very many cattle are to be found which are supposed to be tuberculous, and we get notes from the veterinary surgeons that they are tuberculous; but I never now test whether they are or not, but try the whole method.

Professor W. A. EDGAR said: It is just over twenty years since the Southern Counties Veterinary Medical Association, under the presidency of the late Dr. George Fleming, passed a resolution impressing upon the Government the importance of taking some measures to combat tuberculosis, and the profession was met then with the objection that they were unable to positively diagnose the disease. It is our great business here to-day, as veterinary surgeons, to say both to the Government and the British public that we are now pretty well able to diagnose tuberculosis. The difficulties of doing it are manifest. Professor Dewar made it pretty clear to us—those of us who have had twenty years' practical experience, trying to differentiate between tuberculosis and other diseases—that we are not much further advanced, as far as ordinary clinical methods are concerned, than we were twenty years ago. Indeed, I would say that men who were thoroughly trained in the old pleuro-pneumonia days were better able to differentiate between diseases and tuberculosis than men of the present day. It requires a long practice, and even after a long practice amongst the living animals one is compelled to own one's impotence to detect tuberculosis, and at the post-mortem one only too often finds how frequently one has made a mistake. But with the instruments placed in our hands now by scientific men no such objection can be raised against a man who is willing to use them. The present opinions respecting tuberculin and those which were issued from the veterinary schools in this country, when the material was first obtained from abroad and given to the schools, almost makes one smile at the difference between them. I venture to think that almost all veterinary surgeons who have given an extensive trial to this agent will admit a larger percentage than Professor McFadyean, with all his natural caution, is willing to admit—80 per cent.—can be detected. Professor Dewar goes so far as to say, quoting an authority, that 98 per cent.

of animals can be detected by the use of tuberculin. When it is our desire to press the force of our position upon the Government, I think Professor Dewar was wrong in advising us to confine our attention strictly to bovine animals, for the value of tuberculin is equally evidenced in others. Personally, I have had experience of it, not only in bovines, but in the dog and poultry. In a number of cases I have used it in equine animals, and I have never got a reaction, and consequently do not know whether I have had a case of tuberculosis in the horse to deal with. But my convictions are just as strong as those of Professor Dewar as to the accuracy and value of tuberculin, providing we shut out the elements of error. The liability of error, as has been pointed out by many able observers, centres upon the amount of care expended upon the work. People want their herds tested cheaply, and no man who values his time is willing to give it up for nothing. Where people require cheapness they will impart an element of error into the question, and where tuberculin is bought and used by other than scientific men we must expect error to creep into the results. Our chief difficulty now as practical veterinary surgeons—and I speak as a practical veterinary surgeon, for after all, all the advice we receive from able scientific men, all the Acts of Parliament which we hope may be passed as the result of this Congress, will all hang for their working upon the practical veterinary surgeon—it depends upon that man, for he has to face the great question when brought into contact with a diseased animal: Is this a diseased animal or is it not? And upon that opinion, expressed and acted upon by individual veterinary surgeons, scattered all over the country, will rest the amount of security which may result from the scientific teaching and the Acts of Parliament which may follow its adoption. At present we are only able to exercise our powers with regard to our diagnosis. Practically now a veterinary surgeon is placed in an exceedingly awkward and (to a man who has a conscience) difficult position. The animal may show some disease of the mammatis gland, and the veterinary surgeon has to determine whether that disease is tuberculosis, and a source of danger and possible death to human beings, or whether it is not. The first thing, then, we have to consider is our relation to the public, our responsibility to the public, the value of security of human life. (Hear, hear.) I contend if any error is to be made it must be made against the cow and the owner of the cow in the interest of the public, if life and health are concerned. The most able scientific men have shown us that a cow may have tuberculosis of the mammary gland and yet not show sufficient evidence even for the expert to tell, but tuberculin will give almost unerring result. Professor McFadyean has shown us that although bacilli are generally present in the milk of tuberculous cows, yet there is a certain stage of the disease in which they are not to be found in the milk, and he especially warns us that we must not conclude, because we cannot find bacilli in the milk, that the cow is not tuberculous. If that cow reacts to tuberculin, I contend, as a practical veterinary surgeon and the guardian of the public health, that the milk of that cow has no right to be sold to the public, and she ought to be isolated from the herd.

A Paper entitled—

DIAGNOSIS OF TUBERCULOSIS IN BOVINE ANIMALS BY THE AGGLUTINATION OF KOCH'S BACILLUS IN HOMOGENEOUS CULTURES,

By M. ARLOING, of Lyons, who was unable to be present, was read by Dr. COURMONT, as follows :—

In 1898 I showed how to obtain homogeneous cultures of Koch's bacillus in glycerinised broth, and that the bacilli grown on this culture were agglutinated more or less rapidly by the serum of some animals impregnated with bacilli or tuberculin, and by that of human subjects affected with tuberculosis.

Since then I have, in collaboration with Dr. Paul Courmont, published a series of articles showing the advantages to be gained from the use of sero-agglutination in diagnosing human tuberculosis.

In September, 1900, I published in "Le Journal de Médecin Vétérinaire et de Zootechnie," of Lyon, a short memorandum of my first attempt to apply sero-agglutination in the diagnosis of bovine tuberculosis. Since then I have often repeated my experiments, with the following results, which I beg to submit to the Veterinary Section of the London Congress, which has considered the question of the diagnosis of bovine tuberculosis of sufficient importance to be placed in their list of subjects for discussion.

The Method of Producing Sero-Agglutination.

If one possesses the necessary homogeneous culture in broth for the phenomena of agglutination, it is the simplest thing in the world to test a serum. It is only necessary to take some narrow glass tubes, like homœopathic tubes, and to mix in them the serum and the culture in the proportion of 1 in 5, 1 in 10, and 1 in 15, or 1 drop of serum to 4 of the culture, and 1 of serum to 9 of the culture, and 1 of serum to 14 of the culture. If the serum used has been obtained from an animal with tuberculous lesions, the mixtures 1 in 5 and 1 in 10 will have become quite clear in from six to twelve hours, or sometimes in an even shorter time. It may happen that the 1 in 15 may show the same phenomenon to the same extent, but there would most probably be a clotted sediment, and the liquid above it would remain muddy. The serum of certain tuberculous bovine animals will occasionally agglutinate and clarify a culture to this extent in the proportions of 1 in 20 and 1 in 25, and in exceptional cases in even smaller proportions.

It is very important to note that diagnosis by agglutination is established by the complete clarification of the 1 in 10 mixture. It is not sufficient to observe the agglutination of a larger or smaller number of bacilli; it is essential that in the 1 in 10 mixture all should be well agglutinated and precipitated to the bottom of the tube.

So then the degree of agglutination is more important than the agglutination

itself, that is to say, the agglutinating power which can be ascertained with the naked eye.

It is essential that the culture used should possess a fixed degree of agglutination. The most useful degree is generally to be found in a culture of twelve days' growth, but as the age of a culture does not necessarily imply always the same richness and development, the culture should be tested before use. A good culture should be clarified by serum from a healthy beast in the proportion of 1 in 5, and agglutinated imperfectly at 1 in 10.

Having obtained this culture it should be placed as it is in an incubator for a fortnight or three weeks, some drops of formalin should be added to it (to begin with ½ to 1 per cent.). When it is too rich in agglutinating substance, which is shown when it is not clarified by serum from a healthy calf at 1 in 5, a little ordinary broth or sterilised salt-water should be added, and then some more formalin. In the case in which it is too easy to agglutinate—that is to say, too poor in agglutinable substance—it must be kept for a longer period in the incubator until it is in a suitable condition.

After a fortnight or three weeks a formalised culture loses its agglutinability and becomes too "hard" for making any agglutinations which would be useful in diagnosis. These details are of the utmost importance; by ignoring them, some experimenters, such as Drs. Beck and Rabinowitsch, have obtained contradictory results, which we do not consider acceptable in view of the uniformity and exact precision we have obtained in our experiments.

The Foundation on which the Diagnosis Rests.

The diagnosis such as we have formulated in the preceding paragraph is based on a large number of observations, corroborated by post-mortem examinations.

As a fact we tested the serum of 40 healthy calves and 50 healthy cows and oxen, and 90 cows and oxen suffering from different degrees of tuberculosis, killed in the slaughter-houses at Lyons and examined by the veterinary inspectors at these slaughter-houses. In fact, these inspectors themselves confirmed the existence or otherwise of tuberculosis.

The serum from calves never agglutinated my cultures even in the proportion of 1 in 2. That of healthy adults 24 times clarified the culture at 1 in 5; 26 times it only accomplished an incomplete precipitation of bacilli. The serum of tuberculous adults clarified 48 times at 1 in 10, 33 times at 1 in 10 and 1 in 15, 8 times at 1 in 10, 1 in 15, and 1 in 20, and in one case only did agglutination fail to take place with 1 in 5.

A considerable number of observations under the aforesaid conditions enables us to affirm that the power of resisting tuberculosis in bovine animals coincides with an agglutinating power of 1 in 10 and upwards.

We do not pretend that complete sero-agglutination at 1 in 10 is an infallible test, nor that tuberculosis cannot exist with an agglutinating power below 1 in 10; we do not go so far as that, since we do not yet know the reason for the phenomenon. But we consider that we can lay it down as a

fact that sero-agglutination, positive and complete at 1 in 10, of an animal suspected of tuberculosis will go a very long way to turn that suspicion into a certainty.

Comparison of Sero-Agglutination and the use of Tuberculin for Diagnostic Purposes.

The way to ascertain the diagnostic value of agglutination is to compare it with tuberculin, which, though not infallible, gives exact information in the majority of cases.

The comparative tests I have been able to make myself have unfortunately not been more than 21, of which six only were followed by post-mortem examinations.

I have made a list of the results of these 21 experiments, which you may examine later. They may be summed up as follows :—

COMPARISON BETWEEN THE TESTS OF SERO-AGGLUTINATION AND TUBERCULIN.

No.	Agglutination.					Reaction to Tuberculin.	Diagnosis by		Post-Mortem.	Remarks.
	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{15}$	$\frac{1}{20}$	$\frac{1}{25}$		Tuberculin.	Agglutination.		
1	+	+	+	+	+	2·3	+	+	Tuberculous lesions	
2	+	+	+	+	+	2·2	+	+	Laryngean tumour	Not tuberculous.
3	+	+	+	...	...	2·2	+	+	No visible tuberculosis	
4	+	Ξ	Ξ	...	...	0 1	−	−	,, ,,	
5	+	+	+	...	...	0·7	−	+	Numerous tuberculous lesions	
6	+	+	+	...	...	2·1	+	+	Tuberculous lesions	
7	+	±	−	...	...	0·0	−	−	No autopsy	
8	+	+	±	...	...	1·8	+	+	,,	
9	+	+	±	...	...	3·0	+	+	,,	
10	+	Ξ	−	...	...	0·3	−	−	,,	
11	+	Ξ	Ξ	...	...	0·1	−	−	,,	
12	±	Ξ	Ξ	...	...	0·5	−	−	,,	
13	+	±	±	...	...	0·0	−	−	,,	
14	+	±	±	...	...	0·2	−	−	,,	
15	+	+	±	...	...	0·4	−	+°	,,	Suspicion with agglutination.
16	+	±	±	...	...	0·7	−	−	,,	
17	+	±	±	...	...	0·6	−	−	,,	
18	+	+	+	...	...	2·7	+	+	,,	
19	+	+	±	...	...	0·2	−	+°	,,	Suspicion with agglutination.
20	+	±	±	...	...	0·0	−	−	,,	
21	+	±	±	...	...	0·4	−	−	,,	

Meaning of Signs.

1. In the Agglutination column : + = complete clarification, ± = incomplete clarification, Ξ = choked-up agglutination.

2. In the Diagnosis column + = tuberculosis, − = no tuberculosis, +° = suspicion of tuberculosis.

In these cases the result of the test with agglutination concurred eighteen times with the tuberculin test; twice tuberculin gave a negative return when agglutination gave a doubtful one involving suspicions; in one case tuberculin replied negatively and agglutination positively. In these two cases post-mortem examination showed that the animal was affected with considerable tuberculous lesions.

Finally, in two cases where tuberculin and agglutination both gave a positive result, post-mortem examination failed to show the existence of tuberculosis. So that sero-agglutination, *well applied*, gives results which compare favourably with those of tuberculin.

Remarks.

Sero-agglutination then offers another method of establishing the diagnosis of tuberculosis in bovines: it can either be employed to corroborate the tuberculin test, or to replace it when there are reasons for believing that its effects cannot be relied upon, as for instance, in case of fraud.

It may be asked, in this connection, if the injection of tuberculin is not capable of developing agglutinating power in the serum of a healthy animal so far as to give it the qualities of serum from a tuberculous subject.

This question is a serious one, seeing that a conscientious owner may, by injecting his animals with tuberculin with a praiseworthy object, be giving them the appearance of tuberculosis if they are afterwards tested by sero-agglutination.

I have tested the agglutinating power of serum from a certain number of both healthy and tuberculous subjects before and after the tuberculin test, and I have never found sufficient difference between the two to falsify the diagnosis.

There is then no reason why sero-agglutination should not follow the tuberculin test.

I cannot at present tell if there is any relation between the strength of agglutinating power and the extension of the tuberculous lesions in man; we concur with M. Paul Courmont that in the gravest cases agglutination is often weaker. I have found moderate or weak agglutinating power both in cows with considerable and also with advanced lesions.

I have not yet exactly proved at what age in bovine animals agglutinating power develops at 1 in 5. One finds it in nearly all healthy subjects. I have noticed this power in the case of animals of fifteen to eighteen months.

I would say, in conclusion, that agglutinating power is not necessarily transmitted from mother to offspring. I have compared the tests of serum from some cows and their calves the day after birth or a day or two later, and when agglutinating power was positive at 1 in 5, and even at 1 in 10 in the mother, it was practically *nil* in the calf. On one occasion a calf's serum produced a precipitate at 1 in 5, the mother's serum agglutinating between 1 in 5 and 1 in 10. Consequently, in the hypothesis of serum from a calf freely agglutinating at 1 in 10, the animal owes this quality, not to tuberculosis in its mother, but to infection in itself.

A DELEGATE: With the very greatest respect, Sir, I may say there are many of us very anxious to hear the answer to the question asked by Mr. Read, and I should be very glad if it could be answered now.

The CHAIRMAN: When Professor Dewar replies at the end of the discussion, it will come in in the usual course with the answers to any other questions that may be asked.

Mr. WILLIAM FIELD, M.P., Dublin Victuallers' Association: This really affects a very important trade, and we want to know what the foreign professors and scientists think on this particular question. In my opinion it is really the kernel of the matter, and I am sure a great many people will agree with me as to the practical result which will come from this conference.

Professor MCEACHRAN, of Montreal: It goes without saying that my visit here has been a very instructive one and a very pleasant one, and it gave me great pleasure to hear the paper read by Professor Dewar, and to listen to the scientific expositions given by the foreign professors. I have to speak on Friday on a kindred subject, and therefore would beg to be excused if I limit my remarks now to one or two points which have arisen out of the discussion. Professor McFadyean limits the reliability of the tuberculin test to 80 per cent.

Professor MCFADYEAN: I think it is perhaps advisable that I should explain what I intended to say, at any rate, and that was, that in 80 per cent. of cases of tuberculosis that exist at any given moment in cattle, one cannot without tuberculin give any opinion at all. I did not commit myself as to what the proportion of errors was when you resort to the use of tuberculin.

Professor MCEACHRAN: In my experience, which is somewhat extensive, in Canada we can rely upon it almost exclusively. Professor Nocard took the ground—and I think he still sticks to it—that tuberculin cannot lie. We find that out of some 18,000 tested last year, whenever post-mortems were made we did not find 2 per cent. in which an error had taken place. In the United States Dr. Sutherland has the same experience, that you can rely upon tuberculin as a diagnostic agent in 98 per cent. Professor Bang, I know, limits it to about 80 or 87 per cent., but Professor Bang is a very careful man, almost as cautious as a Scotchman. Several remarks have been made with reference to udder infection as comparatively rare, and fortunate indeed that it is so, because we know that if udder infection were more prominent tuberculosis in animals would be exceedingly prominent. A year ago I wished to conduct some experiments at our station at Montreal, with reference to milk, and I gave instructions, which were scattered over the whole of Canada, to have sent to me any case giving milk with udder infection. For six months I could not find one giving milk which was worth sending. Diseased udders were reported, but we could not find one answering the purpose, and had to produce it by inoculation of the udder. Therefore my

experience of udder infection is that it is not very common. Uterine infection, however, is much more common than is generally supposed, and uterine infection is one of the dangerous contagious diseases which should be always looked for by inspectors. I cannot conclude without making one practical suggestion arising from the remarks made by a gentleman this morning, from which I gather that he probably leads his clients to believe that tuberculin is not what is claimed for it. When you find that foreign countries and the colonies have taken up tuberculin, and they are determined that no cattle shall be introduced into their countries without having been tested with the tuberculin test, then that gives it an important commercial aspect, and the breeders of thoroughbred stock in England must adopt the tuberculin test, otherwise the probability is that they will lose a very valuable market.

Mr. SIDNEY VILLAR: The actual practical value of tuberculin is very well indicated by the third paragraph of Professor Dewar's paper. In that paragraph he points out, and I am sure most veterinary surgeons will bear him out, that one of the first indications of tuberculosis in young cattle is frequently a rustling noise in the throat, a noise which is made when the animal is eating. He goes further, and tells us that this noise may also arise from other conditions, from the condition known as actinomycosis, and I am sure he will bear me out when I say it often arises in an animal which is in a perfectly normal condition, and is due really to deposits of fat round the glands of the throat. This, of course, occurs more particularly in animals which are very well bred, animals which we Britishers are proud to think are produced here and are exported all over the world. I say that the use of tuberculin in such cases as this is of the utmost value to agriculturists and is of the very greatest value to the exporters of cattle and to our countrymen across the sea and foreign buyers; because, by simply injecting a young animal, say six months old, you get a certain knowledge whether this abnormal sound in the throat is due to tuberculosis or simply due to a deformity. But I do not and I cannot think it is of such value commercially as was indicated by Professor Edgar in speaking on tubercular mastitis (infection of the mammary gland). I understood him to say that, supposing one were suspicious that the infection of the gland was of a tubercular nature, he would inject the animal with tuberculin, and if he got a reaction he would condemn the animal as having tuberculosis of the udder and would not use the milk. I have absolute knowledge that that is not at all times correct. In a particular herd, when testing, certain of them would react, and some of the animals within a short time developed infection of the udder. In one particular herd I caused the milk of cows which suffered from mastitis and which reacted to the test to be bacteriologically examined for the presence of the tubercle bacilli. My friend Dr. Dean did this for me, and he also used the inoculation test—he inoculated some of the milk into smaller animals, such as guinea-pigs. Upon microscopic examination none of the tubercle bacilli were found and the inoculated animals did not develop any disease. Therefore I say that we cannot at once conclude, because an animal reacts to

tuberculin, that we are justified in saying the disease of the udder is necessarily tuberculous. One cannot help thinking that the reason we are told no lesions of tubercle are found at the post-mortem is because of the fault of the dissector. The whole question is an intensely scientific one, and one must approach it from a purely scientific point of view. I take it that a scientific post-mortem examination cannot possibly be made on carcases in a slaughter-house dressed to be used as butcher's meat. It is impossible for a man to say absolutely there is no tuberculosis in the animal, unless he cuts up the carcase and so lacerates it that it is impossible to put it on the market.

Mr. LAITHWOOD, the Chief Veterinary Inspector of the County of Cheshire, said: In the majority of cases I have been unable without the help of tuberculin to diagnose this disease. As we have heard, an enlargement of the lymphatic glands, especially those of the neck, and of any other portion of the body, and a gradual loss of flesh, especially accompanied with a cough, are exceedingly suspicious symptoms; but we must bear in mind that when we get to this stage we are bordering very nearly upon the later stage of the disease. If on examination of the mucus coughed up by an animal we find the tubercle bacilli, a definite opinion may result, and the same may be said on exploring with a needle any of these enlarged glands or the udder. But the most reliable and valuable diagnostic in my experience is undoubtedly tuberculin. After testing over 4000 animals, chiefly dairy cattle, in the county of Cheshire and neighbouring counties, I have found very few mistakes to occur. Where the animals have been slaughtered, I have found the test corroborated in 96 per cent. of cases. I may say that I have found a considerable number of diseased animals. There are, as a rule, in Cheshire large herds congregated together, and the larger the herd the more disease is found. That we can only expect when we consider it is a contagious disease. On a number of occasions I have found in small herds no disease whatever. In a number of tests I have summed up the percentage of those which have reacted, and have found that 37½ per cent. of the dairy cattle have reacted to tuberculin, and even as many as 12 per cent. of the remainder have reacted on the second test after an interval of six months, although the homesteads have been thoroughly disinfected as far as possible, and complete isolation has been brought about. I have asked myself how it is that so many have reacted on the second test after having once passed the ordeal, and I can only conclude that what has been found by Professor McFadyean and others is true, namely, that a certain incubative stage is necessary in the disease before a reaction will take place. I am also of opinion that some mistakes have been made by myself in not taking the temperatures at the fifteenth hour after injection. It is well known that these reactions occur at different periods in different animals, and I have found in certain districts that about 3 per cent. of reaction will have the highest degree at the tenth hour after injection, that 80 per cent. will attain the highest from the twelfth to the fourteenth hour, that 12½ per cent. will rise to the highest point from the fourteenth to the sixteenth hour, and 3½ per cent. from the sixteenth to the

twentieth hour. I am firmly of the belief that we have no element of such immense value in the diagnosis of the disease as thoroughly reliable tuberculin, properly injected, and the temperatures carefully taken from the ninth to the twentieth hour after injection. I have used chiefly 3 c.c. of tuberculin obtained from the Royal Veterinary College, London, but I may say that I have seen 1 c.c. of Paris tuberculin cause a reaction in 50 per cent. of the animals. I have asked myself why should tuberculin cause a reaction in a tuberculous animal, and the only explanation to my mind is that tuberculin being the product of the tubercle bacilli, a quantity of tuberculin must exist in the tuberculous animal at the time of injection, and that when an increased quantity of this element is suddenly introduced into the system a rise of temperature results, but the quantity is not sufficient to cause a rise of temperature in an animal that is not tuberculous. I have come to the conclusion that a certain number of animals will undoubtedly recover. I have seen most marked reactions on a number of occasions. Animals have been turned out into the field and given as much fresh air as it was possible, and after an interval of six months a number of the animals did not react to the test. That is only what we may expect to occur when we find the immense value of the open-air treatment in the human subject. I cannot say it depends entirely upon the stage of the disease, for in one instance, after a marked reaction had taken place in one young heifer, she was turned out and exposed to the fresh air as much as possible, and after six months she was again tested, and the result was that only a very small tuberculous nodule could be detected in one of the mesenteric glands, and that was not larger than the size of a pea. But the small nodule was still virulent, for, on Professor Delépine injecting a portion of it into rabbits, the tubercle bacilli were found to be in a very active state, so that although this was a subject of the very earliest stage of the disease and was exposed for six months to open-air treatment, the bacilli had not become exterminated or even decreased in virulence. Mention has been made of the healthy condition of the udder of a reacting animal occasionally giving tuberculous milk. In one instance, in some experiments I was permitted to carry out for the County Council of Cheshire, the only animal that gave tuberculous milk was a very healthy-looking animal which reacted to tuberculin. On examination of this cow's udder no particle of disease could be detected by manual manipulation. Not only myself, but three other veterinary surgeons and the medical officer of health examined this udder previous to slaughter, but we could detect nothing whatever in the shape of tuberculous nodules. So that it is an undoubted fact that the examination of udders by manual manipulation only is not sufficiently reliable to exterminate tuberculosis from the milk supply.

Mr. T. Eaton Jones, a delegate from the Liverpool Corporation, said: I only wish to say that a gentleman on this platform to-day has made statements which are absolutely incorrect and unfounded. I allude to Mr. Pottie, of Paisley. I think it is very unfair that he should come on to a platform in a public assembly and use the name of the Liverpool Corporation

without giving the full facts. On behalf of the Liverpool Corporation I say his statements are absolutely false. I have done all the testing of the Liverpool Corporation cattle for a very long time—in fact, ever since they were tested—and have made post-mortems in every case, and I have never found anything that he alludes to. The post-mortem examinations were made by myself and three other persons, one being Professor Boyce, of the Victoria University, and both the cows were certified as suffering from tuberculosis. I may say that in Liverpool we have every confidence in tuberculin, and I can only add to the remarks of the other speakers by saying that we believe it to be infallible. I believe some people say it diminishes the value of the animal, makes it give less milk or lose flesh, but I have never found a cow, except in one case, give less milk. I do not think they often lose flesh, and it does not depreciate their value in any way.

Mr. Councillor WILLIAM RAMSDEN said: As a member of the Health Committee of the Corporation of Liverpool I desire to corroborate the statement just made by our Inspector, Mr. Eaton Jones, with regard to the statement about the two animals.

Mr. POTTIE said: I am not speaking on my own evidence ——

The CHAIRMAN interposed, saying: We cannot have a discussion. (Hear, hear.)

Mr. J. S. LLOYD, of the Health Committee of Sheffield City Council, said: I have just a few remarks to make on the diagnosis of the disease of the udder in milking cows. I have nothing to say with regard to the tuberculin test. I have not had a very large experience in it, although I have had a little. As many of my veterinary friends in the audience know, I have been for about a year and nine months acting as veterinary surgeon to the Sanitary Committee of the Corporation of Manchester, and during the whole of that time my work was principally confined to examining cows. During that time I have examined 5,300 cows. The way the model milk clauses are carried out in Manchester is that samples of milk are taken at the station or *en route* in the carts, and these samples are taken to the Victoria University and examined by Professor Delépine. Of 401 samples taken 47 were proved to be tuberculous by the inoculation test. Following up these 47 samples to the farms from which they were sent, I have found 36 tuberculous cows at 32 of the farms. At the other 15 farms I found no tuberculous cows. Control samples of the milk were taken from these farms and in each instance found to be innocuous at the second test. I may say that out of the 32 farms there were four to which I had to pay a second visit, and the control samples in these instances really make 19 in my first visit. In one case the cow was still on the farm, although I failed to find her. What I intended to bring forward was the difficulty in diagnosing the disease in an udder in the early stages. In addition to these four obscure cases I have also seen a number of

cases in cows which I have examined without having any samples of mixed milk taken from the herd. In one case I took a sample from a cow because she was a waster, and it was proved to be infectious by inoculation. I again visited the cow, and I found, on a third visit seven weeks after the first, a slight induration of one hind-quarter, but it was so very slight that it was practically not to be taken into great consideration. I spoke to Dr. Delépine and Dr. Niven, the medical officer of health, on the matter, and as a result of our conference we decided to take a sample of milk from it, which bore out my diagnosis of the slight induration. The milk from that teat was infected, and the milk from the other three was free from defects. Professor Owen Williams spoke about deaf quarters, and I can very fully bear him out in his remarks with regard to the deaf quarters of disease following mammitis. If the deaf quarter wastes away there is no danger with it, but if it is left and replaced by a large indurated mass of tissue, in my opinion the cows have been tuberculous. The milk from these quarters has not been in my opinion milk, but more a muddy-coloured serum, and in each instance Professor Delépine has been able to find tubercle bacilli by examining with the microscope. Moreover, in several cases I have had of that description there has always been disease in one or other quarter of the same udder. In examining the udder of cows I have always had a free hand in taking samples of milk from any cow I thought had a suspicious udder. During the time I have taken samples from considerably more than three times the number of cows that have had tuberculous udders. As regards microscopic examination of milk, Professor Delépine in a recent Paper has stated that in about one-half of the milk from special cows he found tubercle bacilli by microscopic examination. He has given the number of samples of milk from special cows he has examined, and no doubt he is quite correct in taking the maximum. But taking the milk from the different cows I have sent to the Victoria University for his examination, he only found bacilli in about two or three. I think Mr. Laithwood mentioned the fact of having tuberculous milk from a cow showing no disease of the udder. That bears out what I have been speaking of, the difficulty of finding it. I am satisfied myself that when the milk is tuberculous the udder is diseased, but it may be in such an early stage, with so little induration or hypertrophy present, that it is not easy to detect it by manipulation. If we keep such a cow under observation from eight to twelve weeks it will be found that the udder becomes diseased, so as to be observed by the veterinary surgeons who have had experience in manipulating cows' udders.

Mr. C. E. Pearson, of the National Federation of Meat Traders' Association, Sheffield, said: Professor Dewar mentions in the latter part of his paper that "for the full and successful use of tuberculin as a diagnostic agent several things are required: (1) A thoroughly reliable tuberculin. There is no doubt but there are tuberculins and tuberculins, and as tuberculin can have no definite and unalterable chemical composition, there is no security for its quality but in having it properly prepared by a competent pathologist or pathological chemist, and carefully tested before being sent out for general

use." I maintain that if this thing is prepared by a competent pathological chemist and it is necessary to have it tested afterwards, its value is reduced. I contend the very fact of its being prepared by a chemist of that description should prove to us it is a reliable agent. I am speaking as a butcher, and we are not altogether satisfied with tuberculin as a reliable agent, because we have had cases where it has been used and we have found that the beast has reacted when it was not suffering from tuberculosis. I think that is a statement which is not in favour of the tuberculin test. If this test is an infallible one, I want to know whether the Government is prepared to supply the trade generally with a test that is infallible. I think Professor Dewar will agree with me that is a very important point. I am very pleased to have this opportunity of speaking on the subject, because we as butchers give place to no man in our wish and desire that the awful scourge of tuberculosis should be eradicated from mankind. We as butchers in bygone days suffered exceeding and great loss. At the present time we are not so very much better off. Had the medical officers of this country and the inspectors that were appointed acted up to the report that I believe our honourable Chairman had a hand in drawing up, the butchers of the present day would not have to take the active part they have had to do in this particular matter. I must congratulate you, Sir, as being the second President who sat on the Tuberculosis Commission and on appearing to be in such apparently good health and strength, and I can assure you that hundreds of people, and the butchers of to-day, are pleased to see that you are still taking as active a part in this question as you did some years ago.

Mr. WILLIAM FIELD, M.P., said: The question I want Professor Dewar to answer is: Is it possible, by inspection, to diagnose and certify the disease of tuberculosis in the living animal without having recourse to the tuberculin test? I am connected with the meat trade, and this is a burning question, because we are obliged to buy the animals in open market just as they appear. Afterwards these beasts may be confiscated, and the trade has to bear the loss. I think that is really the practical question we have to consider here to-day. I am a Member of Parliament, and I understand one of the results of this Congress will be that the House of Commons will be asked to introduce some measure with regard to compensation for confiscation; and unless this question can be answered we have no basis or data in the House of Commons on which the Legislature can act. I do not wish to take up the time of the Congress, but it appears to me this is one of the most practical subjects with which we can deal, and I am sure the members of my trade and also the farmers and agriculturists present, who are really as much interested in this question as we are, will support me. It comes to this, we are throwing the trade into the hands of the foreigners, and therefore we want a plain and simple answer. We do not want the tuberculosis question carried on as a kind of conundrum which nobody seems to be able to solve. We want a business-like answer to a business-like question, and to know exactly where we are and the lines on which legislation should proceed in the House of Commons,

Professor DEWAR, in reply, said: I must first thank this critical audience for the very gentle way in which they have handled my Paper. The first question was one handed up to me by Dr. Porter, stating that he would like to know whether I have formed any opinion, or if any opinion can be formed, of the length of time after the application of the tuberculin test, and failure to react to it, the animal can be said to be probably free from tuberculosis. I am not quite sure that I thoroughly understand what Dr. Porter means. It has not been claimed that tuberculin has any immunising power on an animal, that is to say, an animal is as likely to contract tuberculosis after it has been subjected to the tuberculin test as it was before. There is not the least doubt there must be some short incubative period; and if an animal is free from tuberculosis at the time the tuberculin test is applied, we may take it it will be some weeks before it would react to the tuberculin test again, and in that case it might be held to be perfectly free from tuberculosis. The next question is by Mr. William Read, of the Central Meat Market, and urgently supported by Mr. Field. I think I have two copies of that question, and Mr. Field read another, which differs from each of them. However, I will read one. "Would it be possible even for a professor to detect tuberculosis in animals, before emaciation has set in, by simply looking at them in the yard, field, or market?" Now, in answering that question, I would say for myself, and I believe for my colleagues who are designated by the name of professors, that we do not claim there is any divinity hedging a professor as far as the diagnosis of tuberculosis is concerned. In the second place, I would state plainly that, as a rule, it would be impossible. I would also say that it might be done; but even supposing it were, the probability is that the veterinary surgeon, whether a professor or not, if he were as cautious as Scotchmen are usually credited with being, would tell his client that the probability was that the animal was infected. He would not give a definite statement in such a case, as this question presupposes. With regard to the remarks which have fallen from the various speakers there is very little for me to say. I think I can nearly pit the one speaker against the other. I can pit Mr. Pottie against Professor McFadyean. I think I strike the happy medium. Mr. Pottie comes forward as a practical veterinary surgeon, but I will not allow I am any less practical than Mr. Pottie. I am perhaps not quite so old, but I have examined a good many cattle in my time. I began very young, and I think I am a practical veterinary surgeon. With regard to the remarks which fell from Professor Williams about testing animals prior to their becoming affected with tuberculosis, of course we all know and ought to know there is a daily variation of temperature even in healthy animals. When fever does set in there may be some intermittency in the fever, but after that time, as a rule, the animal is undoubtedly affected with tuberculosis. My friend Professor Edgar found fault with me for confining my remarks to the diagnosis of tuberculosis in the bovine species. I think I had quite sufficient to do. I was confined to half an hour, and I think I kept within it, and I did the best I could in the time allotted to me. I did not want to wander into other matters more than I could help. I certainly did not claim that tuberculin was an infallible test for tuberculosis; but we

have nothing altogether infallible in this sublunary sphere, and it is as nearly an infallible test as anything we are likely to get. A great deal depends on all the circumstances connected with the manner in which the test is going to be applied. Mr. Pearson, from Sheffield, mentioned that it would be very desirable if a tuberculin could be obtained that was always reliable, and the Government would take it under its protection. This would certainly be very desirable, and if the Government ever does such a thing it would be also desirable that the Government should take under its protection the distribution of the tuberculin, and name the authorities who are to apply it. I must again thank you for the very kind manner in which you have received my Paper.

Mr. JOHN M. MIDDLETON said: Might I have an answer to my question?

Professor DEWAR replied: Mr. Middleton is very largely interested in the milk trade, and he has asked me whether it is not possible that some of the forty-seven samples of infected milk referred to by one of the speakers could have been infected in transit.

Mr. LLOYD said: I have no reason to think that the milk had been infected in transit, and I have no reason to say it was not. All I know is that 47 out of the 401 were tuberculous, and that at 32 of the farms 36 tuberculous cows were found.

Professor DEWAR said: I think that is an answer to the question.

The CHAIRMAN concluded the first meeting of the Section by saying: The section we have dealt with this morning has been, of course, a limited one, referring to diagnosis, and I have endeavoured as far as possible to keep to the text, and I think I have fairly succeeded. But the matter is to be discussed very much more fully on subsequent mornings in this room. To-morrow morning the subject will be "Tuberculosis and the Milk Supply," and on Thursday morning "Tuberculosis and the Meat Supply;" and then many of the questions which have been mooted in passing will come on for consideration on Friday morning, that is to say, the legislative and other measures necessary to combat tuberculosis amongst animals. By the time the whole work is finished, I apprehend we shall pretty well have gone over the whole ground.

On the motion of Mr. FIELD, a hearty vote of thanks was accorded to the Chairman, and the Section adjourned.

SECTION IV.

The Second Meeting of this Section was held on Wednesday, July 24th, 1901. Sir GEORGE BROWN, C.B., again occupying the Chair, opened the sitting by saying: It will be absolutely impossible for us to commence proceedings without some reference to the address which was delivered by Dr. Koch yesterday.* I daresay you have all had an opportunity of reading it, because it has formed a very prominent part of all the papers that have been published this morning. All that I want to call your attention to is the statement that human tuberculosis is not communicable to the cow. As Dr. Koch pointed out, it does not absolutely follow that in consequence thereof bovine tuberculosis is not communicable to men, but it offers a fair presumption that that is the case, and it has been taken advantage of at once and will be undoubtedly. A large number of persons concerned with cattle, as the meat trade and the milk trade, will probably rush to the conclusion that all the restrictions that have been thereby imposed upon them will be at once removed. I need hardly say that anything so utterly rash as this will not be attempted. The matter is one of tremendous importance. The discovery announced by Dr. Koch is even more startling than his discovery of the tubercle bacillus; but it must not be forgotten there are other views and there are other experiments. I was reminded by Mr. Villar yesterday that I had inoculated cattle during the work of the first Royal Commission, which went on from 1890 to 1895, with human sputum, and they had taken tuberculosis. I remember injecting some human sputum from the Brompton Hospital into the peritoneal cavity of a calf, and that animal became tuberculous. Professor Crookshank, working at the same time, carried on a series of experiments, and I am told there are in the Museum the results of those experiments, showing the action of human sputum on cattle. Unquestionably further inquiries will be made, but I thought it better in the first place that the matter should be mentioned, as the statement made by Dr. Koch would naturally have an enormous influence, and it is desirable that there should be no excitement about it. It would be very unwise for anyone connected with the trade, who considers himself oppressed by regulations, to make any sudden rush. What one has to do is to simply wait.

Mr. J. A. W. DOLLAR, M.R.C.V.S., opened the discussion upon—

TUBERCULOSIS AND THE MILK SUPPLY.

Referring to Professor Koch's statement of the previous day, he said: "Few of those who attended the meeting in St. James's Hall yesterday were prepared for the startling, I may say sensational, statements of Dr. Koch. To be asked, on the basis of a score of experiments extending over six months, to cast to the winds all the teachings of all the most eminent men

* A Paper read before the British Congress on Tuberculosis, July 24th, 1901.

of all European countries during the past quarter of a century, is to me an excessive request, and one to which I decline to accede. I cannot help thinking the time and the terms for this announcement might have been better chosen, and that Dr. Koch's statement is calculated to have a very injurious effect on the attempts now being made to diminish the spread of tuberculosis."

Mr. DOLLAR then proceeded :—

The essential identity of human and bovine tuberculosis, indeed of tuberculosis in all mammals, was experimentally demonstrated long before the discovery of Koch's bacillus.

Villemin and many other experimenters early showed that the infection was of the same type, and that its lesions were identical whether the material for inoculation were derived from man or from the ox. Chauveau, Klebs, Bollinger, Crookshank, and many others transmitted the disease from man to the ox.

The later discovery of Koch's bacillus, and its constant presence in the specific lesions in all animals, clearly proved the practical identity of tuberculosis in all mammals.*

The transmissibility of tuberculosis from animals to man necessarily may not be made the subject of experiment, but reported cases exist which have almost the force of experiments. The best known perhaps is Ollivier's. Thirteen girl-scholars in the pension of the Dames Blanches, at Chartres, though born of healthy parents and always previously enjoying good health, became ill after for some time drinking milk from a cow which, on slaughter, showed well-marked tuberculosis of the udder. Five died.

Similar, though perhaps less striking cases have been reported by Johne, Hermsdorf, Leonhardt, Sonntag Stang, Schuppenhauer, and Demme. Mazÿck P. Ravenel, of the Sanitary Board of Pennsylvania, described before the Philadelphia Pathological Society in June, 1900, five cases of tuberculosis of the skin in man produced by direct accidental inoculation with bovine tubercle bacilli. In four cases the victims were veterinary surgeons.

The transmissibility of bovine tuberculosis to man, and the constant presence of tubercle bacilli in milk from cows with clinical tuberculous lesions of the udder, being conceded, several highly important problems immediately arise, the solution or partial solution of which we are here assembled to attempt. Very briefly they are as follows :

In what degree is the milk of tuberculous cows dangerous to the consumer? Next, what is the proportion of cows in this country infected with tuberculosis, and especially with tuberculosis of the udder? Lastly, what measures are called for to guard the public against the spread of tuberculosis through the medium of milk?

To revert to the first question: It is at once fairly obvious that milk

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* Chauveau, "Identité de la tuberculose de l'homme et de la tuberculose des bovidés, des gallinacés et autres animaux," "Report of Second Congress on Tuberculosis, 1891," p. 51. Nocard, "Sur l'identité des tuberculoses de l'homme, du cheval et du porc," idem, p. 137.

containing tubercle bacilli has only a relative infectivity for adults. The results of careful investigation show that a certain proportion of all samples of milk commercially retailed contain tubercle bacilli, and the same conclusion is logically deducible.

Obermüller* found among 13 samples of commercial milk from a large Berlin establishment 8 infected. The results were confirmed by Lydia Rabinowitsch.† Jäger‡ tested 100 consecutive samples of milk delivered to a hospital in Könisberg, and found tubercle bacilli in 7. Petri examined 102 samples of butter and found tubercle bacilli in 17.

Bollinger§ found that 16·6 per cent. of samples of commercial milk in Munich contained tubercle bacilli; Martin in Paris found 33 per cent.; Bang in Copenhagen 15·5 per cent.; Obermüller in Berlin 7·5 per cent.; Fiorentini in Milan 10 per cent.; Peters in Boston 33 per cent.; the Paris Municipal Laboratory 40 per cent.; Hamilton, Boyce, Woodhead, and Delépine in Liverpool 29 per cent; and Delépine alone at Manchester 25 per cent.

Given that a proportion of all milch cows suffer from tuberculosis of the udder, it is clear that in the mixed milk of large dairies some samples must necessarily be infected, and that the larger the number of cows contributing to a common sample the greater the probability of that sample containing the specific bacillus. On the other hand, if a certain concentration of the bacilli is necessary for infection, the admixture of milk from many cows may in itself prove a factor of safety, the proportion being lowered by dilution with normal milk. At the same time such dilution implies risk to a larger circle of consumers. Knuth, of Berlin, who carried out a long series of experiments, administered virulent milk of constant composition to guinea-pigs in doses varying from one-twentieth of a gramme up to 300 grammes. He found the animals which received less than 15 grammes remained healthy, while all those which received more became tuberculous. Similar results have been obtained by Ostertag.

In connection with the transmission of tuberculosis by milk the rarity of primary tuberculosis of the bowel in human beings is somewhat singular. By this I do not mean to suggest that the specific lesion should necessarily always be sought at the point of entry of the organism—the feeding experiments with glanders bacilli made by Professor Nocard on the horse sufficiently disprove such a hypothesis—but the results of a careful search for reported cases of primary bowel tuberculosis in man are so curious that I consider them worth noting. Among German authorities Schwer, who conducted 123 very thorough post-mortem examinations on children with intestinal tuberculosis, only found ten cases of primary disease.

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* Obermüller, "Uber Tuberkelbacillenbefunde in der Marktmilch," 'Hyg. Rundschau,' 1895, v., No. 19.

† "Beitrag zur Frage der Infektiosität der Milch tuberkulöser Kühe," 'Zeitschr. f. Hygiene und Infektionsk.,' xxxi., 1899, p. 137.

‡ "Über die Möglichkeit tuberkulöser Infektion des Lymphsystems durch Milch und Milchprodukte," 'Hyg. Rundschau,' 1899, No. 16.

§ "Les maladies microbiennes des animaux," 1898, p. 652.

Boltz * found 11 cases of primary disease after 176 post-mortems on children with intestinal tuberculosis. Grawitz, † between 1876 and 1880, only found 10 cases of primary tuberculosis of the peritoneum among all the cases occurring in the great Charité Hospital in Berlin, but saw 202 secondary cases. Biedert's ‡ *résumé* of 3104 post-mortems on tuberculous children only contains 16 unquestionable cases of primary tuberculosis of the bowel. And yet these figures, small as they are, seem enormous when compared with the unquestionable cases of primary bowel tuberculosis in adults. Behrens, § a very capable authority, gave a critical survey of all the recorded cases in German literature up to the year 1894. They were two in number, that of Wyss and that of von Eisenhardt. A few others have since been published, but they are extremely limited in number. On the other hand, many cases of intestinal tuberculosis in children occur in which it is impossible to demonstrate whether the bowel lesion is primary or secondary, so that the actual proportion is probably greater than that observed.

Bearing in mind, then, that a considerable proportion of commercial milk contains tubercle bacilli, that milk is largely consumed in a raw state, that in the cases where infection has been directly traced to the consumption of tuberculous milk, such milk has almost invariably been derived from a single cow suffering from tuberculosis of the udder, and, therefore, delivering milk of an exceptionally dangerous description; bearing in mind all these facts, I say, and the further facts that whilst during the past fifty years tuberculosis in English cattle has shown an alarmingly rapid increase, human tuberculosis in adults has diminished by 45 per cent., I venture to suggest that for normal adults the danger is very much less than might at first appear.

On the other hand, the danger to infants and to debilitated persons, or those recovering from illness, is probably very great, the more so as the risk is often repeated. Since 1850 the mortality from abdominal tuberculosis in children less than one year old has increased by 27 per cent. Of 1,000,000 children born 4278 male and 3454 female children die of tuberculosis (particularly in the form of *tabes mesenterica*) during the first year. ‖ The majority of deaths occur between three and six months of age. Though still high in the second year, the mortality is less than one-half that of the first year, and from then sinks rapidly. Professor Heubner found that of 800 healthy three-months-old children 26 per cent. had become tuberculous by the end of the first year. He thinks infection often occurs by inspiration of infective material, but that the nourishment, which is largely cow's milk, also plays an important part.

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* Boltz, "Ein Beitrag zur Statistik und Anatomie der Tuberkulose in Kindesalter," in 'Diss. Kiel.,' 1890.

† Grawitz, 'Charité-Annalen,' 1886, xi., p. 785.

‡ Biedert, "Die Tuberkulose des Darms und des lymphatischen Apparates," 'Jahrbuch für Kinderheilkunde,' xxi., p. 158.

§ Behrens, "Über primäre Tuberkulöse Darminfection beim Menschen," in 'Diss. Berlin.,' 1894.

‖ *Lancet*, 1899, April 22nd.

Distribution of Tuberculosis in Cattle.—Mr. C. Hunting, who examined 4000 English cattle, found 20 per cent. tuberculous. Comparatively recent official figures show a proportion of 18·7 per cent. in Durham, 20 per cent. in Midlothian, 22·8 per cent. in Yorkshire, 25 per cent. in the dairies in London, and 40 per cent. in those in Edinburgh.

In Denmark, of 158,991 oxen tested with tuberculin 48,955=31 per cent. reacted.

In Sweden, of 35,922 tested 15,203=42 per cent. reacted.

In Norway, of 30,787 tested 2,589=8·4 per cent reacted.

In Belgium 60 per cent. reacted.

In Italy the figures vary between 7·5 per cent. in the Roman abattoirs and 30 per cent. in Lombardy (Fiorentini).

In Massachusetts, U.S.A., during 1897 58·9 per cent. of the cases reacted.

In New Zealand Mr. Gilruth, chief of the Veterinary Department, stated so long ago as 1897 that 50 per cent. of the older breeding cattle were infected. As these animals are rarely housed, he considers that the disease is chiefly spread by ingestion. The Report for 1898 of the Chief Inspector of Stock for Queensland shows that from 2½ to 9 per cent. of the carcases of cattle there slaughtered were *condemned* for tuberculosis. Mr. A. W. Barnes, M.R.C.S., who for twelve years acted as inspector of the largest meat works in Queensland, states having frequently condemned from 15 to 20 per cent., and in one instance as many as 75 per cent.

In Germany the figures vary between 37 per cent. and 97 per cent., depending on locality. Röckl found 20 per cent. of all slaughtered oxen tuberculous. Cows are probably more frequently affected.

The reports of the Prussian slaughter-houses for 1899 showed 16 per cent. of all slaughtered cattle to be tuberculous. In Berlin during the same year 153,437 animals were slaughtered, and 30,167=19·87 per cent. were found tuberculous.

When, however, we take the case of *cows alone* the figures become much higher. Of 48,172 cows slaughtered in Saxony during 1899 over 35 per cent. were tuberculous. The older the animals the higher the figures. Thus, of 14,684 cows over four years old slaughtered in Berlin 14,556, or 99 per cent. were tuberculous. The lesions, of course, were in some cases trifling, only the bronchial glands being affected. These figures, however, are founded on macroscopic examination in slaughter-houses. On the basis of the tuberculin test the proportion would in general be much higher. Siedamgrotzky placed the proportion for several large establishments in Saxony at 79 per cent., and Eber, reviewing an extensive series of reports, at 78·2 per cent.

Of these, however, a very small proportion suffer from tuberculosis of the udder. Lungwitz only found 119 tuberculous udders among 17,202 slaughtered animals, *i.e.*, ·7 per cent. But only a proportion of these were cows.

In Saxony, of 16,000 cows recognised as tuberculous on slaughter in 1897 only 230, or about 1·4 per cent., had tuberculous udders. During the previous five years the figures had been 1·2, 1·5, 1·7, 1·2, and 1·1. The figures for Prussia and Denmark are practically the same.

Professor Stockmann, on the basis of 300 examinations, places the proportion of town-kept milch cows infected with tuberculosis of the udder at from 1·8 to 2·1 per cent. Messrs. Young and Walker, of Aberdeen University, examined 77 milch cows and found about 10 per cent suffering from tuberculosis of the udder. The results of the London County Council's examination would seem to indicate that about ½ per cent. of London cows suffer from tuberculosis of the udder.

Professor Ostertag believes that in generalised tuberculosis the udder is diseased in from 5 to 10 per cent. of cases. Rieck places the figure as high as 17·6 per cent.

The common use of goat's milk as a diet for young children demands the exposure of the dangerous fallacy that goats are immune against tuberculosis. Eichhorn states that his attention was called to a herd of 28 goats, in which one had died of advanced tuberculosis. He then tested the remainder with tuberculin. Nineteen showed a reaction of more than 1° C. Two of these were slaughtered and found tuberculous. Siegen found 10 cases of tuberculosis among goats at one of the Luxembourg slaughter-houses. Cadiot, Gilbert, and Roger * have shown the goat enjoys no immunity against the disease. The use of goat's milk must therefore be subject to the same precautions as that of cows.

Sheep are much more resistant than cows, but asses, also used as a source of milk, are susceptible to tuberculosis (Stockmann).

Methods of Prevention.—The surest and easiest method of ensuring against milk-borne tuberculosis is for the consumer to boil all milk before use. This, however, presupposes a degree of care on the part of the public which experience has hitherto failed to indicate. The education of the public must certainly be placed in the forefront of any system of preventing tuberculosis. Short of this, several methods present themselves, viz. sterilisation or pasteurisation of all milk, eradication of tuberculosis from all herds of milch cows, or a combination of such methods.

Although pasteurisation or sterilisation of all milk would economically prove very difficult, partly on account of increased expense, but chiefly because of the objection of adults to the taste of boiled milk, it is certainly not impossible, as is shown by the example of the "Pasteur" Milk Establishment in Copenhagen, where the milk is heated to 85° C., cooled without contact with air, and retailed at ordinary prices in microbe-proof vessels to the extent of 7000 gallons per day. The entire staff of the dairy is under medical control. Should anyone in the family of any employé be taken ill that employé is suspended (on full pay) until the illness ceases. Similar businesses have been instituted in Amsterdam and Strasburg.

Dresden and Leipzig both possess State dairies, which sell milk pasteurised by Soxhlet's procedure at very reduced rates, and several of the large London dairies retail sterilised milk, though at considerably enhanced prices.

According to recent reports, milk heated to 110° C. with agitation, and

* 'Clinical Veterinary Medicine and Surgery,' Cadiot and Dollar, pp. 575–8.

under strong pressure, suffers no change in flavour and is of course rendered perfectly sterile.

If commercially successful, this method would appear to solve the whole problem. A company has been formed to work it in this country.

The eradication of tuberculosis from herds is perhaps only one degree less difficult than its eradication from the human race. But private enterprise has stepped in where the State feared to tread, and in isolated cases at least has proved successful. The firm of Busck in Copenhagen submits its dairies to constant veterinary control, places its employés under medical inspection, removes all infected cows, and takes the utmost precautions in regard to cleanliness in milking and in storing and distributing the milk. Several of our London dairies advertise milk from special herds proved free of tuberculosis, though I am not aware whether such stringent precautions in regard to employés are observed as are above indicated. But here again the apathy of the British public defeats the best of intentions, and the general verdict of producers appears to be that comparatively trifling demand for guaranteed pure milk does not justify the extra expense involved in its production.

The provision of a safe national milk-supply is intimately linked with that of the eradication of tuberculosis from herds of milch cattle. It, therefore, calls for the regular supervision of all herds of milch cattle by veterinary surgeons, the removal and slaughter of all cows with tuberculous udders, the segregation of all cows reacting to tuberculin, and the sterilisation or pasteurisation of their milk, the prompt separation of calves from tuberculous mothers after the first day, and their feeding on sterilised milk, the separation of calves from cows in large establishments, and the classification of animals according to age, it being well known that the extent and frequency of the disease tends to increase as age advances. Furthermore, it demands the provision of ample housing space, good light, good ventilation, pure and ample water supply, sound fodder and exercise (if possible at grass), all of which tend to improve general health, and thus to increase the natural powers of resistance to the disease. Floors and mangers should be of impermeable material, common drinking troughs should be suppressed, and although tuberculosis is rarely congenital, the healthiest stock should be selected for breeding, and in-and-in breeding should be avoided.

Even these measures, however, seem insufficient to stamp out tuberculosis entirely. In Belgium, Canada, and the United States, especially in Massachusetts, attempts have been made to eradicate tuberculosis by the use of tuberculin, but have not proved altogether encouraging, and have therefore been suspended. In New Zealand again, cattle which have never been housed, which live in an ideal climate, and are practically in a state of nature, have been shown by Mr. Gilruth to suffer from tuberculosis to a very large extent. Probably the most complete and sweeping legislation for the conduct of the milk trade is that proposed by the German Milk Trade Union (Das Deutsche Milchwirthschaftlichen Verein), and although the scheme will not meet with universal approbation, it is at least worthy of discussion as showing the position adopted by enlightened members of the trade principally interested.

The scope of the proposed law is chiefly confined to cows with generalised tuberculosis or udder disease. The introduction of tuberculous cows into the German Empire is to be forbidden. The draft law proposes that every milk establishment should be inspected by an expert veterinary surgeon at intervals of not more than three months, and that the milk of every cow which after clinical examination and testing with tuberculin is suspected of tuberculosis should be microscopically tested by the expert, and if necessary further tested by inoculation experiments. Control samples are to be taken for the purpose of appeal if required. An appeal lies to the Imperial Health Office or other competent authority to be afterwards appointed.

Owners may not part with animals suspected of generalised tuberculosis or tuberculosis of the udder, except for slaughter. Such animals must at once be segregated, and their milk only sold after heating to 85° C. These restrictions cease immediately should an appeal, made to the Imperial Health Office or other appointed authority, be decided in favour of the owner.

Every cow whose milk is condemned by the Imperial Health Office is to be valued as a milch cow and at once slaughtered under police supervision.

The difference between the value of the animal as a milch cow and as meat is to be defrayed out of Imperial funds. No compensation of less than fifty shillings or more than £15 will be awarded. The value as a milch cow might be based on the yield of milk at the time of condemnation. Penalties for offences against this law are proposed.

The above recommendations fall somewhat short of those adopted by the International Veterinary Congress at Baden-Baden, which were as follows:

1. Milch cows, goats, etc., should be placed under regular and periodical veterinary inspection.

2. The sale of milk from tuberculous animals for human use should be forbidden when the animal is wasted or shows tuberculosis of the udder.

3. Wasted animals or those with tuberculosis of the udder should be removed and slaughtered in accordance with the methods adopted in Denmark and Sweden, the owner being compensated.

Owing, however, to the extreme frequency of tuberculosis the former less sweeping proposals would probably receive more support. They aim at first removing cows which yield infectious milk, and for this purpose detection of the bacilli in the milk is necessary. Fragments might also be removed from suspected udders by the use of the "harpoon," and examined clinically and microscopically. The finding of the first expert would, if challenged, be controlled by the verdict of the Imperial Health Department. As certain "acid-fast" bacilli which stain like those of tubercle have been identified by Obermüller, Rabinowitsch, Petri, and others, it might in cases be desirable to make inoculation experiments as well as microscopical examinations. At present, however, the point is of secondary importance.

Any law of this kind must necessarily be uniform and compulsory throughout the country. Our present permissive style of legislation has proved worse than useless in regard to other matters like meat inspection, and has left England far behind other European nations.

Mr. J. BOWEN-JONES, of Shrewsbury, said: It is not my intention this morning to follow the very able paper that has been read to you by Mr. Dollar, but I shall refer to what I call the practical methods which, in my opinion, should be employed to get rid of the danger to human health and life from the use of tuberculous milk. I was extremely pleased to hear the remarks of the Chairman and of Mr. Dollar with regard to the very startling statements which were made by Professor Koch yesterday. It occurred to me as I came down in my cab this morning that if these statements were in any degree accurate, legislation of a repressive character to prevent tuberculous milk or meat being sold to the public was absolutely unnecessary, and we may as well let the thing take its own course. But I, like these gentlemen, have very grave doubts on the points raised yesterday and the propositions which were put forward, and I contend we should not look back at the present moment, but go on as far as possible to protect the public from injury from this insidious disease. I do not intend to take any branch of the subject that has been referred to by Mr. Dollar except that which comes under the designation of legislation as being applicable to this country and probably to the world at large, and which I hope will be shortly enforced if public opinion will back the position which I take up. In the first place I am of opinion that it would be impracticable at the present moment to schedule the disease of tuberculosis in cattle to the Contagious Diseases (Animals) Act. If that were done, with compensation for slaughter of tuberculous animals, the fact of an animal being tuberculous would have to be arrived at by some test, and from what I heard yesterday, and from what I gathered from other sources, that test must be the tuberculin test. I say it is absolutely outside the range of practical politics to expect that the agriculturists of this country would submit to the decimation of their herds under that test, or that any government would be able to provide or would be willing to provide the compensation that would be necessary to repay the farmers who lost their herds for the public good. I make that one point in my contention, that whatever loss the farmer has to incur for the good of the public, that loss should be made up to him by the public purse. In reference to the tuberculin test, although it is not the subject we are discussing to-day, it has a certain bearing. The tuberculin test appears, although we have no exact figures, to show that a very large number of the animals tested react, and if that is be taken as indicative of tuberculous disease a very large number would have to be paid for if they were killed. I do not myself believe, after what I have heard, in the absolute infallibility of the tuberculin test, and, therefore, I say it is impracticable to have legislation founded on that test. I remember very well an experiment being carried out by a Professor who was on this platform yesterday, in which ten animals were tested with tuberculin, and on being slaughtered and examined by him they were found to indicate no signs of tuberculous disease. To the lay mind it would seem that no tuberculosis existed in these cases, but my mind is not so subtle as the imagination of the Professor, and he explained the matter away by saying that an ordinary examination of the carcases, although they were placed at his own disposal, was insufficient to show whether

there was tuberculous disease or not. He said, in other words, that they were indicative tests, and he must make mince-meat of the animal before he could say there was tuberculous disease or not. If it exist to only that infinitesimal degree, surely no one of us would be surprised that the consumption of that meat produced no ill effects on the consumers. That, and the fact that the Queen's herd which was killed reacted, and a small percentage only were found to be diseased—the Professor tells me I am wrong with regard to that—but the fact that generally speaking a large percentage of animals, especially dairy cows, do react whether they are tuberculous or not, only strengthen my arguments in favour of the proposals I am going to put before you. I am very glad to hear that tuberculous disease of the udder, as far as it is proved by the slaughter of the animals so far as the cattle slaughtered have come under the observation of experts, is very small. Now, gentlemen, I think I have said sufficient on the question generally, and I will come to the particular propositions that I wish to make to you. The first is, "That this Congress is of opinion that general legislation on the subject of the inspection of dairies is urgently required, whereby uniform regulations with regard to the sale of milk shall be enforced by the local authorities subject to the control of the Local Government Board or the Board of Agriculture." This I contend is necessary. It should be compulsory, because we know that the different medical officers of health and the various local authorities throughout the country do not carry out their regulations in a uniform and systematic way. Even in the model milk clauses of the private Acts of Parliament that have been passed during the last two or three years we see different degrees of restriction, different regulations, and varying arrangements made from year to year. I think that this question should not be dealt with locally. It may be controlled locally, but it should be under a general Act of Parliament that would be uniform and regular throughout the country. (Hear, hear.) The next proposition I have to make is, "That the expression 'local authorities' should comprise county councils as well as the existing local authorities." It will be obvious to those who have had to do with the control and administration of local affairs that there is a great diversity of action by the local authorities themselves. The sanitary authorities now have the power of making arrangements for the inspection and control of dairies. The sanitary authorities are district councils, the rural and urban district councils. There is no uniformity of action. They have power now to apply to the Board of Agriculture or the Local Government Board, I forget which, for the control and management of dairies and cowsheds under the Dairies and Cowsheds Order, but they do not always exercise it. We want county councils to have concurrent jurisdiction, and we believe excellent results will follow. My next proposal is, "(*a*) That there should be periodical inspections of all dairies and cowsheds by local authorities by means of qualified inspectors within their respective districts. (*b*) That notification by the owner, of every disease of the udder, should be made compulsory. (*c*) That upon a medical officer of health or other inspector of a local authority issuing a certificate of the existence of any disease of the udder, milk from the affected animal or animals shall not be

used for human food until a qualified expert shall certify that such milk is suitable for that purpose. (*d*) That upon a medical officer of health or other inspector of a local authority issuing a certificate of the existence of tuberculous disease of the udder such certificate shall be supported by the certificate of a veterinary inspector of the Board of Agriculture, or of a veterinary surgeon. (*e*) That as soon as practicable after such certificates are issued the medical officer of health or the inspector of the local authority shall bring the case before a justice, who on being satisfied of the existence of the disease, shall order the slaughter of the infected animal or animals, and shall direct full compensation to be given to the owner thereof, provided the disease is of recent origin. (*f*) That all compensation shall be charged against and paid from imperial funds."

You will understand that we do not want the wasters or any animals in an advanced state of disease to be compensated for. Where an animal has only recently developed the disease it is only fair and just that the owner should not be mulcted in heavy loss for the good of the general public. These propositions are made in order to carry out, with the minimum of friction to the agricultural public and the owners of stock, safety to the public at large. Instead of requiring a new Act of Parliament, or a new departure in which the Board of Agriculture would have to take up the whole business—which, I think, is impracticable at the present moment—we leave it to the present authorities who are dealing with the disease and wish to impose those compulsory restrictions, so that the public shall be safeguarded in the fullest degree. I will move what I have read as a resolution.

The CHAIRMAN said: Mr. Bowen-Jones has placed in my hands the resolutions which he has read, and I can promise you that they shall go before the General Meeting on Friday next, at which meeting the certified resolutions will be submitted to the members present.

Professor MCLAUCHLAN YOUNG said: It is extremely kind of the Chairman to say, as he has done, that he will give me a little extra time. I do not desire it, however, as what I have to say will be very short and, I hope, to the point. Yesterday a remark fell, I believe from Professor McEachran, that some of the speakers were as cautious as a Scotchman. I feel that we are here, not as Scotchmen to be cautious, but as a body of scientific gentlemen to give a certain expression of opinion which will be of some use to agriculturists and not to the profession only. I feel that we are over-cautious. Yesterday we had speakers who said that tuberculin was invaluable, but they hedged round that opinion with various qualifications until the lay member or agriculturists did not know where they were. At the finish of yesterday's meeting they had not had a decided opinion given to them, and did not know whether tuberculin was of value or not. To-day we have had a most excellent paper on the subject of milk, but again I say that the agriculturist does not know where he is. Many expressions were made in that paper, but they were still hedged round. Certainly we ought to be cautious, but we

cannot go to the extreme that a certain gentleman went yesterday. We must have what might be termed a middle course. We all certainly desire to be cautious in our statements, and we desire nothing but the bare truth. We desire no notoriety. We also say that such sensational statements as were made yesterday afternoon savour very much of a desire for notoriety. ("No, no.") I am only expressing my own opinion. Coming to the subject of milk, I have long held that it is surprising that the authorities should be so strict in their inspection of meat, but so lax in their inspection of milk; more especially when you remember that meat is the staple diet of the adult who is strong to resist disease, and that it is always cooked before it is used, while milk is the staple diet of the child who is not so strong to resist disease, and milk is seldom or never cooked; consequently I hold that the authorities might with great advantage direct more attention to the inspection of the milk supply and leave meat a little alone. We know, as has been proved by experiment, that when meat is cooked to a certain point at a certain temperature the meat is rendered safe. We also know that if milk is sterilised it is also rendered safe, and were we confident that such methods would be adopted by the consumer of milk we might allow the cow to pass without inspection. But we are not satisfied with that. The milk is not sterilised or cooked, and in raw milk there is great danger. I myself uphold most strongly that if the authorities desire any inspection to safeguard the public it is the inspection of the dairy cow, and not the meat. Yesterday a great deal was said about the tuberculin test. The tuberculin test to a certain extent affects the milk supply, because if we had power to test cows in the dairy we might be able to find out the animals diseased and the animals which are not diseased. When I make that statement I assume that the test is infallible, and on that point I wish to sound a note of warning. Agriculturists have no doubts about the test—in fact, they make use of it. The Canadian Government have sent over here to test cattle before they go from our shores. There is no doubt whatever about their representatives' ability, which we all know is beyond dispute, but we find the second-class dealer buying animals that have failed to stand the test and submitting these animals to this representative of the Canadian Government. The dealer asks the professional man to test the animal, which is done, and it does not stand the test. A week afterwards he submits the same animal to the representative of Canada, and the result is that the animal for the time being is immune and is sent across as sound. Our professional brother who makes the test is not to be blamed, but the test is blamed, and in that way we have the test called in question. I am no special pleader for the test. All I know is that in my hands it has proved eminently successful; but we have what I might call unscrupulous dealings with the test, and the test is brought into question. If properly used the tuberculin test must be good, and if not properly used then it may or may not be bad. But if we have men, and I say advisedly unscrupulous men, who use the test for the benefit of their pocket, then do not blame the test, but blame the men. The test is good, and is used in some towns with milch cows. If we had the power to go round our dairies and

test animals then we might be of some service in safeguarding the public, but unfortunately we do not possess that power. Consequently, unless we as a body can submit an authoritative opinion that the test is of value in dairy cows, and that were we possessed of powers to test the animals we should be of some value in safeguarding the public, I am afraid that this Conference will be of little or no use. In the commencement of my remarks I said that I felt strongly caution was everything; but at the same time I also think we should give an authoritative opinion about any fact where we feel we are in a position to give that opinion. The majority of us have done a considerable amount of work on the subject, and we have all more or less made up our minds to a certain point. We feel that we know a little about the subject, and this Conference is expected by the public to give a certain opinion that will be of some value. As far as the milk supply is concerned we ought to say that the tuberculin test is of very great service, and that if we had the power to test cows we should be doing more good than devoting such a great deal of attention to meat. Meat is always cooked and rendered safe; milk is never cooked, and, consequently, if we want to safeguard the public the way lies in using this tuberculin test on the milk-supplying animal, the cow, and removing that animal as soon as it reacts, thereby removing the source of danger.

Mr. W. FIELD, M.P., put the question: Might I ask if the resolutions put forward at this Conference by Mr. Bowen-Jones will be put to this meeting? Unless these resolutions are put and bear the impress of being passed at this meeting they will not be discussed at the other meeting, and will not have the same significance. If the resolutions are to be put I will second them.

The CHAIRMAN replied: I am very sorry that I cannot possibly accede to your request. We have nothing whatever to do with passing resolutions in this Congress. Any resolution that is put in my hands will come before the General Meeting which will be held next Friday, and it is the business of that meeting to pass resolutions. We have no power here to do anything of the kind.

Mr. FIELD again asked: Would it be possible for you to put it as a recommendation and not as a resolution?

The CHAIRMAN said: As I understand, you want it put to the meeting so that somebody may hold up his hand. That is exactly what we cannot do. If the whole meeting choose to shout that they approve of those recommendations I could record the fact that there was a unanimous wish they should be considered.

Mr. FIELD said: As a matter of fact I wish to put it to you that they should be put before the meeting.

Mr. Bailie ANDERSON, of Glasgow, said: I really do not think we can go to that length unless this becomes a conference, and you give every person the opportunity of expressing an opposite view to some of the propositions Mr. Bowen-Jones has put forward.

The CHAIRMAN said: You misunderstand me. I wish to make it emphatically known that I do not intend to put any resolution at all from this chair.

A DELEGATE asked: Before Mr. Laithwood leaves the platform would he kindly answer one question? He refers to what has been done in Italy; might we ask him what has been done there?

Mr. LAITHWOOD replied: That was with regard to appointing State veterinary surgeons to supervise the health of the different counties and the cattle under each jurisdiction; they are paid by the Government.

The DELEGATE further asked: Is it a more uniform system of inspection than prevails in regard to meat and milk in this country?

Mr. LAITHWOOD said: I quite believe that uniform inspection is necessary, and that is why I am very much in favour of Mr. Bowen-Jones' propositions.

Professor S. STOCKMAN, of Edinburgh, said: I should like, as some of the other speakers have done, to say that this startling statement of Dr. Koch is a little ill-timed. It is the sort of statement a man might make in a scientific society for discussion, knowing it would not go outside the walls to the public; but I think it was ill-timed as a public address, especially at a time like this, when we hope we are just about to complete certain regulations dealing with this matter of tuberculosis. Strictly speaking a tuberculous cow is a menace to public health, but I do not for a moment believe that any cow gives tuberculous milk unless she has a lesion of some sort in her udder. The inspector can put a cow off work as it were; he can order the milk not to be sold; but I do not think the provisions contained in the dairy and cow-sheds order are adequate for dealing with tuberculosis. Something more is necessary. In view of the difficulties in the way of the diagnosis and sufficiently frequent inspection I agree with those who recommend a compulsory notification of all udder disease. I also think that when a cow is certified to have a tuberculous udder she should be slaughtered. I do not think a man has any right to keep a cow with a tuberculous udder. Coming to the question of differential diagnosis, as we know, the only certain sign of tuberculosis is the presence of the tubercle bacillus. Of course its absence in a microscopic preparation does not prove that the animal is not suffering from tuberculosis or that a certain lesion is not tuberculous. It is the stage of invasion of the gland in which we find bacilli so few in number that we often fail to detect them with the microscope, even after precipitation in the centrifugal machine. An inspector going his rounds, and seeing a case of this kind, would in all

probability pass it over altogether. Supposing his suspicions were aroused and he searched the milk and failed to find the bacilli, there is only one other method open to him, the one Mr. Dollar referred to, namely, the inoculation of animals. I do not think that is practical, it takes too long. I do not think that in any scheme dealing with tuberculosis of the udder that would be a practicable method of detecting tuberculosis. In his examination of the milk he is likely to find a large number of inflammatory cells, and that for the time being should be a sufficient reason for putting the cow as it were out of action. But there is a difficulty about that. Supposing you do forbid the dairyman, or whoever it is, not to sell the milk from this cow, you would have to ensure that being carried out either by taking the cow away, or by getting the local policeman to look in every now and then to see that the milk was not being sold. Mr. Bowen-Jones referred to the difficulty of using tuberculin on dairy cows, and the stumbling-block, as he said, was compensation. If you make strict rules, and make the test for tuberculosis, tuberculin, you will have to expend impossible sums of money, because you cannot expect the owners of the cows to bear all the expense. I think that makes it impracticable. It is not the expense simply of testing them, but the expense of the compensation. I do not believe the dairymen would accept any scheme of compensation that would not necessitate the expenditure of impossible sums of money. In some places the unnecessarily strict regulations in regard to tuberculous carcases in abattoirs make it doubly impossible for the cow-keepers to slaughter infected animals except at a great sacrifice, or for the local authority even to dream of compensation. Mr. Dollar referred to some statistics which I have furnished with regard to the prevalence of tuberculosis of the udder. These were obtained in the only way that you can get an accurate idea, *i.e.*, by taking large numbers of cows hap-hazard as it were, such as you find in an abattoir, and submitting them to post-mortem examination. I found that out of 1312 2·8 had lesions in the udder. That was, I think, a high proportion, because at the time the inspectors were causing to be sent in all the cows they could find with tuberculosis of the udder, and on account of the strict regulations in the abattoir a very large number of cows were sent away out of Edinburgh altogether to be slaughtered. Nearly all the cows with tuberculous udders were being slaughtered in Edinburgh, while they were not slaughtering all the tuberculous cows, and that, I think, raised the percentage. However, I do not think it is much below 2 per cent., and you can see that in a cow population, if I may use the term, of 2500 you get fifty cows supplying tuberculous milk. With regard to diagnosis, when the lesions are well developed in the gland the bacilli can be often found without much difficulty in the milk. As I said before, their presence is proof positive, but their absence is only negative evidence. We know that the number of bacilli excreted depends on the softening process of the tubercle. In the fibrous lesions which form a very large proportion of the udder cases the number of bacilli excreted is very small, but of course, as I said before, the presence of inflammatory cells may help the diagnosis. Yesterday we heard from Professor Nocard, and Mr. Dollar referred to it to-day, of a method of diagnosing tuberculosis of the udder by

the harpoon. I did that myself ten years ago, and I do not want to discuss the priority, because I have something more important to say about it. Since then I have done six cases. Three of them gave negative results, and three of them were positive. I do not think it is in the least superior to the examination of the milk by precipitation, and it is open to objection by the dairymen. Taking all things into consideration, I do not see how one can recommend anything better at the present than to put in force the recommendations of the last commission on tuberculosis, namely, to keep the clinically affected cows out of the byres as far as possible. I say that this has never had a proper chance. I do not say it will ensure milk absolutely free from tubercle bacilli, but it will reduce tuberculous milk almost to a minimum. I think also that the reason for compensation, viz., unfair loss, would disappear under such a system.

A DELEGATE asked: The speaker referred to a number of animals on which he made examinations, and stated that 2·8 of the animals presented tubercular disease of the udder. How was that diagnosis arrived at?

Professor STOCKMAN answered: By post-mortem.

The DELEGATE further asked: Was it merely a macroscopic examination?

Professor STOCKMAN replied: No, it was microscopic. If you see a lesion you can generally tell whether it is tuberculous or not. You may get a fibrous udder in which there are no tubercles, and these were submitted to a microscopic examination.

Professor W. O. WILLIAMS then spoke: I am quite in accord with the suggestions of Mr. Bowen-Jones and Mr. Laithwood, but I think you will be all in accord with me when I say that of the ox tribe the cow is undoubtedly the centre of infection. If we had no tuberculous cows we should have very little tuberculosis in our stock, and consequently we ought to attack the cow to get rid of the disease. Some years ago I wrote to the local papers in Scotland pointing out that tuberculin was being used fraudulently for the fortifying of cows so as to deceive purchasers, and I recommended then what I now recommend, that tuberculin should be scheduled as a poison, and only sold to practitioners who are going to make use of it for honourable purposes, and not for dishonourable purposes. Even at the present day it is no uncommon thing for tuberculin to be purchased, and cows that are known to be tuberculous fortified so as to be ready to resist the test when the local inspector comes down to see that the cows are in good order. I am also in accord with the suggestion that the extirpation of tuberculosis should be an imperial matter. I suggest that local Boards should be appointed for the purpose of paying compensation promptly. It would be a most serious thing if application had to be made to a central Board in London for the payment of compensation allowed for a cow that had been seized. I would also

suggest that dairy inspectors should be appointed throughout the various districts to inspect all the cows, to kill all those who reacted and had any udder lesion, those who reacted and had no udder lesion being fattened off. The important question is the raising of money for the payment of compensation, and I consider that the trade ought to pay it. Money could be raised by the imposition of a small duty, say a twopenny charge on every animal which was sold, and a sixpenny charge on all cows and fat stock sent to the rings. That would aid and assist us to have a sufficient amount of money to pay compensation. I have nothing further to say, except that I am strongly in favour of Mr. Bowen-Jones' propositions.

Professor AXE asked: With regard to the animals which have reacted to the tuberculin test, would Professor Williams recommend them to be fattened? What would become of the butcher who bought those beasts, and what would be the effect on the public?

Professor WILLIAMS replied: It is quite the custom to fatten off cows at the present day, and there is no reason why cows that were found to be affected with tuberculosis should not be fattened off and their milk boiled and used for other purposes than consumption by human beings.

M. MONTEFIORE LEVI, of the Board of Agriculture of Belgium, said: If we were to put emphasis on the important statement we heard yesterday there would be no more interest in the present discussion. Fortunately, however, we are waiting further developments of the dangerous statement, the more dangerous that it was made by a man whose authority is immense as a *savant* with all scientific bodies and as a man whose name is known popularly everywhere. The consequence is that any statement put forward by him has an enormous importance which it would not have in the mouth of another person. I beg Mr. Dollar to allow me to correct a statement which I understood him to make in saying that Belgium had established regulations, but had suspended them. That is not quite the case. The measure has not been suspended, but in a certain way arrested, because we found in Belgium that we had to meet two important difficulties. The first thing was the quality of the tuberculin. As several speakers have mentioned, tuberculin is not always perfect. It is not merely that the test is not always applied with sufficient knowledge of the subject, but the tuberculin itself is not always of a perfect quality. I am speaking unfortunately not as a medical man, but as a layman, but I have had considerable practice. About ten years ago I had thirty-two milch cows in a perfect state of health. Nobody had any doubt of that. They were constantly followed by a veterinary surgeon and they appeared to be in a very prime state. One animal was brought in with tuberculosis, and I buried at that time twenty-eight animals because they did not resist the tuberculin test. They were all submitted to post-mortem examinations and the whole twenty-eight in a smaller or larger degree showed signs of tuberculosis. I received the tuberculin from Berlin. Another

tuberculin was produced in Belgium, and my veterinary surgeon asked me to let him have some of the tuberculin to make a test upon a cow he was perfectly sure was tuberculous, but which resisted the test. I gave him some German tuberculin which he tried upon that cow who exhibited the very strongest signs of the malady, which shows that a great deal is to be attributed to the quality of the tuberculin. The special point I wish to call the attention of the Congress to—because I very much wish to see general attention paid to the subject and also to see the subject more ventilated than it has been—is the use of goats' milk, particularly for tuberculous patients. Mr. Dollar mentioned, if I understood him aright, that goats were liable almost as much as cows to tubercular disease. That was not at all the result we obtained in Belgium. We found in a general way that it is almost impossible to inoculate goats with tuberculosis. There is a very great prejudice against the use of goats' milk because it has a peculiar flavour, in fact what we call *une odeur de bouc.* But I have recognised that when you use peculiar breeds of goats which have no horns there is no taste in the milk whatever. When I had to bury my unfortunate cows I had to produce milk somehow for a considerable population. I used goats for many months, but I took care not to tell my friends what milk it was they were using, and nobody was able to say that it was anything else but good cows' milk. Goats are very easy to rear, requiring hardly any care or attention and little food, because they pick up a great deal; they can find food everywhere, they give a good deal of milk, 416 litres a day, and when they have to be killed, the meat is not bad at all; therefore they should be made use of. The question of sanatoria is every day becoming more important, and if it is proved there is much greater security in goats' milk than in the milk of cows it would be of great importance in supplying milk to the sanatoria. A herd of goats would breed very easily and give milk which would be innocuous.

A DELEGATE requested: Might I ask that some one should speak to us now who is a cow-keeper.

Mr. MARTIN said: I just wish to say that I quite agree with one of the speakers—I think it was Professor Williams—who said his idea was that the sale of tuberculin should be kept out of the hands of unscrupulous people. If that could be done by registering it as a poison or in any other way I think the result would be very good. The only other point I should insist particularly upon is the inspection of cows periodically, not less frequently than once in two months; the separation of all cows showing any disease of the udders and the milk from such cows being pasteurised. If they recover from any disease and were found free by the tuberculin test they might go back to the herd, otherwise they should be got rid of.

Professor AXE said: By the courtesy of the Council of the Congress I have been deputed by the British Dairy Farmers' Association to attend this Congress to-day, and I am permitted to say that that body sympathises most heartily

with the movement now going on which has culminated in its gathering together the most distinguished men of science in the world to settle the question—as far as it can be settled—in which they are very much interested. The Association has for a long time been engaged in considering all those facts which in the course of the last ten or twenty years have been discovered by scientific investigation in this and other countries. They feel, with the medical and veterinary professions, that there can be now no question that tuberculosis in cattle is contagious. They assent to the proposition that it is communicable from one animal to another, and I believe until yesterday they were convinced that it was communicable from animals to man. But the startling statement that was made by so distinguished a person as Professor Koch will undoubtedly operate materially in weakening the conviction they have so long held. I do not share with the reader of the paper the opinion that Professor Koch should have suppressed the evidence he has revealed. It seems to me there are certain things to which we readily give assent and which are demonstrable, but when we come to the question of transmissibility of tuberculosis of the cow to man, we give our assent to that which has not received scientific demonstration. Therefore it is of good to the question that Professor Koch should have made the statement in time, so that the attention of this and other countries may be directed to it, and the energies of the medical and veterinary professions directed either to proving it to be a fact, or to placing it in its proper position and committing it to the limbo of exploded fictions. I should like to confine myself as nearly as possible to facts bearing on this question, and I am able to do so in a large measure from the great desire which the British Dairy Farmers' Association have shown to elucidate certain questions pertaining to the dissemination of tuberculosis in man through the medium of milk. Some time ago I was deputed by that Association to make a series of inquiries. The first was to determine to what extent the tuberculin test would demonstrate tuberculosis in our dairy cattle; in the next place, to what extent tuberculosis prevailed as a disease of the udder. For this purpose we sought the aid of dairy farmers in various parts of the country, and we were successful in having placed at our disposal a number of dairy herds for the purpose of being submitted to this test, and for the further purpose of submitting the udders to examination and the produce of these udders to experimental tests. From this inquiry we found that a very large proportion of the 461 animals which were submitted to the tuberculin test gave a tuberculous reaction; but it was a significant point in the inquiry that the incidence of the disease prevailing through the nine herds operated upon showed a very startling difference. In some instances the reactions were to the extent of 90 per cent., while in other instances herds were found—not sought for—in which no reaction occurred at all. This, of course, led to an examination of the conditions under which these several herds were kept, and to an inquiry as to how far it might be possible that the surrounding conditions determined the difference in the number of infected animals in different herds. It was found that where cows were housed day and night throughout the whole of their milking period—

which I need not say extended over months—we had no less reactions than something over 90 per cent.; and we found that as we passed along, that is to say, as the period of housing diminished so did the number of reactions diminish in the several herds, until we came to those herds where the cows were kept out night and day throughout the year, when there was no reaction at all. That seems to be a very striking and practical lesson. It seems to me to suggest and to confirm the general idea among medical men—an idea that prevails, too, amongst my own profession—that if we are to free ourselves or to moderate the prevalence and distribution of this disease we must observe more the laws of Nature and permit our animals to live more under natural conditions. (Cheers.) As one who for many years has been in touch with the agriculturists and the dairy farmers, I know that there are many difficulties in the way. A man might reasonably say that his land was not suitable for the purpose, or that his farmstead did not accommodate itself to the requirements of the suggestion. But I think in some measure the land difficulty might be got over by the use of open yards. Every man may have an open yard, and I think a great mitigation of this evil in the cow herds of the country would be effected by adopting as nearly as possible this out-of-door life. Another objection which is repeatedly submitted is, that the low temperature under which the animal is kept reduces the quantity of milk which she gives. That, I think, there is no question about. If you transfer an animal who has occupied a hot byre to a cold temperature the milk yield will fail. I should like to know, however, whether the difference in the milk yield is as great in animals who are kept out-of-doors as it is found to be when animals which have been kept in warm byres are turned into open yards and exposed to a lower temperature. In one case we had forty-one cows, the most beautiful herd of shorthorn cows reared out-of-doors. They had never known what it was to be in-doors except to be fed, and when reaching adult life to be milked, and in not one of those cows did we find a reaction. The owner got his living by dairy-farming, and there can be no doubt as to the possibility of dairy-farming at a profit by such a system of management. But it will require something more, of course, than the mere observing of this natural system of management. It will be necessary to start with a healthy herd, and having started with a healthy herd, I do not see much difficulty under that system of retaining the herd in health.

Professor B. BANG, of Denmark, said: I am sorry I was not able to be present at the commencement of the meeting, so that I do not know what Mr. Dollar has said, but I think that I, who come from Denmark, the land where we have done the most to eradicate tuberculosis, especially udder tuberculosis, and to have pure meat, should tell you a little about our results and make a few remarks on what we have learned about this question. For three years we have had a law ordering all cows to be killed which were affected with udder tuberculosis. How do we detect these cases? An order is issued to all veterinary surgeons that as soon as they suspect a case they should take a sample of milk from the infected udder and send it in to my

laboratory, so that a search for tubercle bacilli may be made. If you have a law with regard to the killing of cows affected with udder tuberculosis, it is necessary to have scientific laboratories where the search for the tubercle bacilli may be made. It is not possible, I believe, for the ordinary veterinary surgeon or inspector to make the diagnosis of udder tuberculosis and give a decided opinion when the consequences may be the killing of the animal. I believe if a diagnosis is not affirmed by the laboratory there will be many mistakes, and that it will act injuriously. We examine the samples of milk, and if we find it filled with small flocculi, we make a cover-glass preparation, colour it red, and in most cases we very easily find the tubercle bacilli. In other cases when the milk is not much altered, we treat it by centrifugal force. If we find the tubercle bacilli, the thing, of course, is clear; but if we do not find them it is yet possible they may be present, and therefore we write to the veterinary surgeon who sent us the milk, informing him that we have not found tubercle bacilli, but that if he continues to regard the case as suspicious, he must tell the owner it is a suspicious one, and that he must boil or pasteurise the milk before giving it to the calves or swine. After a short time he has to send us again a sample of the milk, and if on the second examination we do not find the bacilli we send him a harpoon or trochar, and tell him to use it and send us a small particle of the udder. In that way we have in some cases found tuberculosis. I think I said a few words about the use of harpoons yesterday, and I agree with the opinions expressed yesterday by other gentlemen that it is not possible to use a harpoon as a common method, as has been recommended, for instance in Germany; I am convinced farmers will not allow that to be done, and it is unnecessary. As a rule, we are able to make the diagnosis through the simple examination of the milk, but there are cases where we cannot do it, and I think it is wise to do what we do in Denmark, and as a last resource use the harpoon. I have proved that our diagnosis was right in almost all cases, because when the cow has been killed I have had the udders, or part of the udders, sent in afterwards to prove whether our finding was correct, and in 99 per cent. of the cases we find the diagnosis was right. Therefore I recommend legislation, enacting the killing of cows affected with tuberculous udders, as we have done in Denmark. We have had very good results. We have killed a large number of cows affected with tuberculous udders. If we kill 500 cows for tubercle bacilli, we have examined at least 1500 samples of milk, and that proves it is not always easy for veterinary surgeons to diagnose tuberculosis. It proves, on the other hand, that farmers are very willing to send the milk in. In most cases the farmer himself detects the swelling of the udder and suspects tuberculosis, and as he is paid by the government he is very willing to send in the milk to the veterinary surgeon. I just want to say a few words on another question, viz., the frequency of tubercle bacilli in milk from tuberculous cows, which have no affection of the udder. This question I treated many years ago. Out of 63 cows very strongly affected with tuberculosis, but with apparently healthy udders, I found only nine cases in which the milk was able to produce tuberculosis by inoculation into the peritoneal cavity of guinea-pigs and

rabbits, 14 per cent. In most of these cases there were very small nodules in the udder itself, but in some cases there were no nodules to be found after slaughtering, and then I had to deal with generalised tuberculosis. In cases of generalised tuberculosis, when the bacilli were to be found in the blood, sometimes there is a discharge from the udder without tuberculous nodules; on the other hand, I am convinced it is a thing which rarely happens even in cases of advanced tuberculosis. It is very probably the case that there will not be tubercle bacilli in the milk if the udder is not affected. Recently a report has been received from Germany. A kind of commission was appointed by the Government, and they examined the milk of a great number of cows which reacted, but did not show clinical symptoms of tuberculosis, and it has been shown that even in cases where there were no clinical symptoms of tuberculosis, but only a reaction, the milk might contain tubercle bacilli. M. Ostertag found some time ago that was not the case, and now he has repeated his experiments on a large scale, and in all these cases it is not possible to produce tuberculosis in animals by inoculation or feeding. That is a result of great value and interest, and therefore I wish to bring it before you. With regard to the out-of-door treatment of cows, I am fully convinced it is best for the cow to be out of doors the whole year, and I think it is very interesting that much less tuberculosis has been found in herds out of doors than in herds which were housed. I find it necessary, nevertheless, to point out that the chief matter is infection. If you have a sound herd of cows, then you may house them the whole year, and they will not get tuberculosis. If you have a tuberculous herd, then, even if the herd is out of doors the whole year, although in some cases cows may recover, the tuberculosis will not disappear.

Councillor E. G. EASTON, of London, said: I do not presume for one moment to occupy your time here, except as a layman with a very limited knowledge of the scientific aspects of the question we are here to consider. But I represent a very large portion of the Congress, the representatives and delegates from municipal authorities and representatives of various trades. For twenty-five years I have been connected with municipal matters, and two years ago I was privileged to be Vice-President of the Public Health Committee of the London County Council, when it was deemed to be advisable that the cows in London should be inspected. I think it has been very gratifying indeed for the London County Council to find that only one-half per cent. of the cattle inspected by the veterinary inspector were found suffering from tuberculosis of the udder, and that number is gradually decreasing. Having been connected with the milk trade for twenty-five years, I have heard with the greatest gratification and the greatest possible pleasure a statement made by Professor Koch yesterday with reference to the incommunicability of tuberculosis from animals to man. I have for many years had considerable doubts as to whether the disease could be conveyed from the animal to man. I have the privilege of knowing an enormous number of families connected with the dairy trade in all parts of England and

Ireland, and the healthiest people as regards tuberculosis are those very families, families who keep cows and sell milk. I was very much astonished to find Professor McFadyean on the first day of this Congress telling us of the terrible tuberculous cow he was able to find on any occasion. From my experience I must say that, although I do frequently see them, they are not so common as Professor McFadyean would have us believe. I believe that as education permeates through the agricultural districts these animals will be exterminated. I wonder no further attention has been paid to the interesting demonstration by Professor McFadyean, the other night, in which he showed us that during the past twenty-two years the diminution in tuberculosis had been from thirty-five per thousand to thirteen per thousand. He did not attribute that to any special cause, but I venture to suggest to the honourable professor that it is owing to the enormous increase in the consumption of milk that this decrease may be looked for. (Laughter.) I hold most emphatically that we do not propose to inoculate one another with tubercle bacilli to discover whether we are likely to take it or not. What we want to know is this: if by passing tuberculous milk through the alimentary canal of the body and the digestive organs of the body we can escape tuberculosis? If we have that immunity all the better for humanity. I maintain it is something the medical profession should be proud indeed to know, that we are relieved of the possibility of such a scourge as the communicability of bovine tuberculosis to man. Instead of any doubt being passed on the statement of Professor Koch, I would rather have heard the whole of the medical and veterinary professions being at one with him in their anxiety to prove whether it was true or not. (Laughter.) Our desire in the dairy trade is to have nothing but the purest possible milk and to eliminate any animal which shows any symptom of disease. Pleuro-pneumonia, foot-and-mouth disease, cattle plague have been eradicated, and I believe eventually it will be perfectly possible to eradicate tuberculosis from amongst our herds. Professor Axe has stated that he found 90 per cent. of cattle affected in a shed.

Professor AXE said: I said 90 per cent. of the animals reacted.

Mr. EASTON replied: Then all the worse for tuberculin. If the professor allows that although 90 per cent. reacted they were not affected, I accept that.

Professor AXE then asserted: I do not admit it; I state a fact.

Mr. EASTON said: I accept the fact. My contention from experience is that, given a herd of absolutely healthy cows placed in a well-ventilated shed, under proper sanitary conditions, those cows will be as healthy as the cows that are roaming in the field. To ask, as has been done, that cows should be kept out all the year in England is to ask an absolute impossibility. How are you going to get milk at Christmas-time from cows in a field, when it is freezing hard? It is a matter of impossibility. Some few years ago there was a great outcry that scarlet fever was communicable by milk. I remember the

Hendon case and sundry other cases, and it was strongly held by the men who owned the cows that the scientists were wrong, that cows did not give scarlet fever in their milk. It was hinted to me that we were to hear to-day that the professor had discovered a diphtheritic germ in the milk from cows. My experience is that the milk is absolutely sterile; if milk is taken from a cow into a sterilised vessel without coming in contact with the air the milk remains perfectly sterile. In times past the veterinary profession were unable to discover scarlet fever germs in milk produced from cows alleged to have given scarlet fever, and so I maintain eventually it will be shown very conclusively that tuberculosis in the human subject has not been owing to transmission from the bovine species. If we could only see it, that is a matter absolutely demonstrated. On behalf of the dairy trade I say I hope they will leave no stone unturned to prove beyond the possibility of doubt that Professor Koch is right. I feel sure that every medical and veterinary gentleman will be only too pleased and delighted to find that their pet theory is unfounded with regard to the communicability of this disease. Mr. Dollar made several statements in his Paper to which I cannot give my adherence, one particularly with regard to boiling all milk. The proposal to boil all milk is absurd. I suppose many of the gentlemen present are acquainted with the enormous ramifications of the London milk trade. But the question of boiled milk is being taken in hand by abler hands than mine in the *Lancet*, and I am sure that Mr. Dollar will admit that if milk comes from a healthy cow and is given to a healthy individual it is much better than boiling milk from tuberculous cows and giving the boiled germs of disease in place of a healthy article.

Professor McFadyean then rose and said: It was not my intention to speak on this occasion, because I felt that, in view of the fact that there were doubtless many here wanting to say something, and the fact that I am to be allowed to have my innings to-morrow, it was scarcely fair that I should take up any part of the time allowed for discussion. Even now, I think, it is possible I can contrive to say all I wish to say in less than ten minutes. The gentleman who spoke last blamed me for having said, on the occasion of my demonstration the other evening, that I could, whenever I liked, find such an emaciated tuberculous cow as the one of which I exhibited the photograph. I do not think he is able to produce any evidence to show that that was an exaggerated statement, and I absolutely stand by it. I can on at least one day in the week in London find quite a congregation of cows like that, and nothing prevented me, except want of time, from having a photograph that would have shown a dozen of them. It is my custom, during the session at the Royal Veterinary College, to go once a week to the slaughter-houses attached to the Metropolitan Market, in order that my students may have the opportunity of seeing diseased organs and any tuberculous organs, and I assure you on many occasions I have seen there on a Monday morning a dozen live cows such as the one I have exhibited, and I have seen on some occasions a larger number than that whose carcases had been condemned

after slaughter. So that, as I said, I am not inclined to recede one single inch from what I said on the subject the other evening. It appears to me that some of those who have been very freely quoting Dr. Koch either were not present at the meeting yesterday or have not done him the honour to read his Paper. Prof. Axe said it is not a demonstrated fact that bovine tuberculosis is transmissible to man. I quite assent. I go further, and I say that it will never be an absolutely demonstrated fact. Does Prof. Axe suppose that in this or in any other country the only experiment which would be crucial, as Koch himself has pointed out, would be carried out—namely, that human beings will have deliberately administered to them milk or other material from bovine animals containing large numbers of tubercle bacilli, in order to see the results? Nothing else would furnish the absolute proof either of the harmfulness or of the safety of tuberculous milk. But we believe in many things that have not been mathematically demonstrated, and I think we may have ample justification for concerning ourselves with the control of milk, although it is not mathematically demonstrated that that milk can induce tuberculosis in human beings. Mr. Easton said that Dr. Koch stated that tuberculosis of animals is not communicable to man. He has not said anything of the sort. I happen to have his Paper in my hand, and what he says is this: "Though the important question whether man is susceptible to tuberculosis at all is not absolutely decided and will not admit of absolute decision to-day or to-morrow." What Mr. Easton has confused with the question of communicability of bovine tuberculosis to man is the transmissibility of human tuberculosis to bovines. Prof. Koch has accumulated further evidence—there was some before—to show there is very little risk of the human disease being transmitted to cattle, but as far as I am aware nobody has ever said there was very great risk of that happening. Prof. Axe also said that Dr. Koch's pronouncement on the subject had greatly weakened the convictions of those whose interests he represented on this occasion, the conviction that bovine tuberculosis is transmissible to man. I should like to know precisely to what extent the conviction is weakened. Everybody knows that udder tuberculosis is a rather uncommon disease, probably two or three per cent. of the cows in the country having tuberculosis of the udder. But the proportion is not much larger than that, so that there are not very many men with more than one cow with a tuberculous udder. Nearly every dairyman and farmer who owns fifty cows requires the milk of at least one cow for his family, and it seems to me that the simplest way of protecting the great majority of the public is that the farmer and dairyman should keep the cow with tuberculous mastitis for his own use. (Laughter.) I do not know whether Mr. Easton's convictions have been removed to that degree, but if they have then he is the very last whose hospitality I would like to accept.

Mr. W. H. Crowhurst, of Canterbury, said: The milk supply being such an important subject, I wish to contribute my experience of the importance of a pure water supply to the cows and good surface drainage in the cowsheds. I was called in to see some diseased pigs that were dying,

and on examination anthrax was the cause of death, due to their eating the blood of two beasts which, being unwell, were killed to save loss and sent to the local town for food (thanks to cooking). All the sows died that ate that blood. The cause of the bullocks' illness was drinking bad water from a pond in the middle of the manure yard. The dairy cows drank from the same pond and the milk was sold. I advised the pond to be filled up, and the milk sale stopped for a time. Another public dairy of fifty or sixty cows were drinking from the ditch water which the cowshed drained into, and occasionally a cow died suddenly. The drainage was altered. Another dairy I was called into to find the cause of death of the fourth cow, which was pond water that the manure yard drained into. Another public dairy, losses of about £200, horses, cows, and pigs from drinking bad water from a pond which the drainage ran into from the houses into the manure yard and from the yard into the pond. Another dairy at a mansion, the cows for years had frequent cases of abortion, which I found was caused by the gas escaping from a drain which was open, communicating from a cesspool; drain done with inside the shed, put outside, trapped and ventilated.

Mr. EASTON asked: The speaker has said that a cow drank from a pond and died suddenly. Does he wish us to understand that that cow died suddenly from tuberculosis?

Mr. CROWHURST replied: The cow died from anthrax. To think that cows can give pure milk from drinking such impure water is absurd, and it shows the importance of every dairy supplying milk being public property, and examined and certified as being properly conducted before the milk is allowed to be sold to the public.

Professor DEWAR said: I just wish to make a remark or two to strengthen our case in support of further legislation in connection with the milk trade. We have had recently, as you all know, an extension of the Dairy and Cowsheds Order which enables dairy inspectors to put out of dairies those cows which are affected with tuberculous udders. But we can do nothing else. Supposing we meet a cow elsewhere, we cannot interfere. Within the last few months I met a cow in a public market with a diseased udder. I had the milk carefully examined, and there was not the least doubt that this cow had tuberculosis of the udder, but we could not touch her. We could, however, manage to use a certain amount of moral suasion with the cow dealer, which induced him to take the cow out of the market in which we were particularly interested, and sell her elsewhere. (Laughter.) We had no right to follow up the cow, and it is quite possible that this cow with tuberculosis of the udder—whose milk I will not say was swimming with bacilli, but in which the bacilli were quite easily found on examination under the microscope—was taken outside the City area and sold to a dairyman who might send his milk back into the town; or he might take the cow to Glasgow and sell it to the good folks at Glasgow. It shows the inconsistency of the law as far as it

goes. We could hardly prevent the man from selling her, though moral persuasion had a little effect. Probably he felt it might be uncomfortable for him afterwards if he did not yield. I mention this just to strengthen the call for further legislation in connection with this subject.

The CHAIRMAN then called upon Professor Crookshank, saying: You will no doubt remember this morning in my few opening remarks that I mentioned some experiments which were carried on by the inoculation of cattle with human sputum. Professor Crookshank, who was working on the subject, has placed a number of specimens in the Museum, and as I hear the professor is present, I have no doubt he will be ready to give you his experience.

Professor CROOKSHANK responded as follows: I came here as a patient listener to a very interesting discussion, and I find myself in a somewhat difficult position in being suddenly called upon to make a statement upon this question. I do not propose to take up much of your time to-day, because I believe I am to have the opportunity to-morrow, after Professor McFadyean's address, of giving you my opinions upon this important matter. But I will take this opportunity of stating that I have placed in the Museum the specimens to which Sir George Brown has referred. I will not let you into the full discussion of the position which I occupy with regard to this question, but I may say that the conclusions I arrived at, and which were published in the report of the Board of Agriculture, are precisely the conclusions which I hold at the present moment. I do not consider that those conclusions have been in the least altered by the statement which has been made by Professor Koch, whom we hold in most profound admiration. But I think I may venture to say that his conclusions are based upon a somewhat hasty generalisation. As a matter of fact, there has been a good deal of exaggeration on both sides, and I believe we shall adopt a middle course, and that the moderate man will be found to be the man upon whom reliance should be placed. I said there has been hasty generalisation, and I will give you an instance. Professor Koch has based his conclusions upon the negative results obtained by the inoculation of cattle with human tubercle bacilli. That, I think, is a hasty conclusion, because it is necessary to make a very prolonged series of experiments. There is unquestionably a difference, whether we inoculate bacilli which have been cultivated during a long series of generations, or whether we use a virulent sputum. In the experiment I did under the direction of Sir George Brown, I used virulent sputum. We selected a perfectly healthy calf and that animal died in two months, and from the seat of inoculation all over the peritoneal cavity there were tuberculous deposits of an extremely interesting character. I am glad to say I was able to unearth from my laboratory yesterday the original specimens; therefore there can be no question whatever, however numerous may be the negative experiments, that you can inoculate calves with human tuberculosis, and therefore we must not come to any conclusions which are based upon results which simply go to prove the negative. One definite demonstration

that human tuberculosis can be transmitted to calves is worth one hundred failures. I do not want you to run away with the idea that I share the extreme views which have been held with regard to the dangers of the transmission of tuberculosis to the human being from cattle. But the position which I venture to hold in regard to this matter is this—that it is a scientific fact that you can engraft the human tubercle upon cattle, and we cannot possibly do the reverse experiment. The position I take with regard to this question is precisely the position which I laid down in the report of the Board of Agriculture—that there may be danger. I say for practical Englishmen that is the policy on which you have to work. You cannot demonstrate there is no danger, there *may* be danger; and I say that that danger may be exaggerated, because I believe that when the organism has been cultivated through many generations upon a soil like cattle, it is with difficulty engrafted on the human race, and therefore we are not so liable as many have imagined to contract tuberculosis by the consumption of tuberculous meat or tuberculous milk. But, gentlemen, the danger still exists, and the whole question is controlled by that little word "may." There *may* be danger in drinking tuberculous milk, there *may* be danger in eating the flesh from tuberculous animals; and as long as that little word "may" holds the position, I say most emphatically do not let us hinder sanitary progress in this country by putting anything in the way of relaxing the efforts we have made towards obtaining pure milk and healthy meat.

Professor RUATA, of Perugia, said: I wish to know on what Professor Crookshank bases his assertion that there is a danger in milk.

Professor CROOKSHANK: That question may be very simply answered. The experiment which I made was one of a long series of experiments in which I was dealing with an extremely virulent case of human tubercle, and it was clearly demonstrated that human tubercle could be engrafted upon cattle. But I was equally influenced in my conclusions by experiments which I was making with milk from an animal suffering from udder tuberculosis. At that time there had been very few experiments made in this country—I am referring to the years 1887 and 1888; and whenever I used the milk obtained from a cow whose milk was distributed with the other milk by the dairy from which I obtained it, I found it contained tubercle bacilli. When I made the post-mortem on that cow I found the whole of the lungs indurated with tubercle, the whole of the intestines covered with tubercular ulcerations, and the specimens are still to be seen in the laboratory of King's College. When I fed animals on that milk or subcutaneously injected it, I had sufficient ground to come to the conclusion that I should very much prefer that milk taken from a tuberculous cow should not be used as an article of food. I found it would produce tuberculosis in pigs, guinea-pigs, and rabbits, and I should certainly not wish my children to have that milk.

Mr. G. W. CARTER, of Keighley, said: Having listened to the speakers

this morning, I feel that, as a delegate from the Corporation of Keighley, a small borough of only 40,000 inhabitants, which has adopted measures for the prevention of the dissemination of tuberculous milk, it would be perhaps of some use if I gave you some information of the procedure adopted. Two years ago the Keighley Corporation, in consequence of the agitation which had taken place with regard to the serious nature of tuberculosis, appointed me an inspector of dairies of the borough. I have to make four inspections a year, examine every cow, and report. I found there were 85 cowsheds in the borough in which were housed about 650 cows giving milk. The corporation also have a sewage farm on which they have 29 cows of their own which were producing milk for sale. As pioneers of the movement in the district, they requested me to submit those 28 cows to the tuberculin test. I obtained the tuberculin from Professor McFadyean, and inoculated the cows, and found that nine of the cows responded. In consequence of my recommendation those nine cows were removed from the herd and taken one and a half miles away to another portion of the farm; eight of them we were able to fatten, and they were subsequently killed. I made a post-mortem examination of every one of them. They were sold to the butcher with the distinct understanding that they were to be submitted to my examination, and if I found tuberculosis which I considered rendered the meat unfit for human consumption they had to be condemned, and the butchers were not to pay for the cows. I examined the eight cows which were killed and found tuberculosis in every instance. One cow we were unable to fatten, and on destroying her we found she was a case of generalised tuberculosis. In the other eight cows the tuberculosis was not generalised; in some cases it was the mesenteric glands and in others the bronchial glands. Every one of those eight cows I thought was fit for human food, and I permitted them to be sold. On behalf of the Corporation, I have since tested 185 cows with the tuberculin test; and of milk cows 58 responded to the test, but I have not had an opportunity of verifying the result by post-mortem. I also wish to emphasize my own feeling that the use of tuberculin should be controlled, as has been suggested, and that it should be scheduled in some manner similar to the registration of poisons, and that it should be only obtained by veterinary surgeons and used by them, so as to avoid the possibility of the dishonest use of the test. I should like also to suggest that the inspection of cows should be general and not local. More than one-half of the milk that comes into the borough of Keighley comes from outside the borough, from places over which we have no control, and where no inspection of any value is made. I believe that the inspection in some of the outlying districts is made by ex-policemen and other such persons. I think it would be of great use and of enormous value to the public if the tuberculin test was used on every cow giving milk for human consumption; all reacting cows should be removed. The initial stage of udder infection is gradual, and it is quite impossible for anyone to say when the milk becomes infected. Every cow which responded to the test should not be allowed to produce milk for human consumption.

Mr. ERNEST H. GODFREY, the Secretary of the Central Chamber of Agriculture, said: We have had the advantage of hearing to-day eminent scientific authorities and the opinions of practical farmers, dairy farmers, and stock-owners. I do not propose to speak from the point of view of science and practice, but rather to offer a few remarks upon the legislative aspect of this question, and what I say I think will commend itself to those who represent science and those who represent the practical farmer, from the point of view of logical sequence of action, practical common-sense, and common fairness to all concerned. Professor Dewar touched upon the working of the model milk clauses, and has mentioned the fact that anyone whose milk is condemned in one locality may send that milk to another locality. It will be in the recollection of most of us here that certain model milk clauses were obtained in private Bills some three years ago by a limited number of large Corporations, mostly in the North of England. These authorities obtained powers which were discussed by the various interests concerned, agreed to, and accepted as a kind of compromise, but one of those authorities obtained a special clause which was different from the others. In the Session of 1900 a larger number of Corporations showed similar powers; but in the Acts of that year, owing to action in the House of Commons on a private Bill of the Taunton Corporation, they obtained what is known as an appeal clause, in which the Local Government Board and the Board of Agriculture, especially the latter, were brought in as representing the interests of agriculturists. What I wish to point out is that the appeal clauses which were inserted in the seventeen Acts of 1900 did not apply to the Bills which were passed in the previous year. Then a large number of Corporations this year have also sought similar powers, and these Acts will be brought in this year. I know as a fact that those Bills contained special appeal clauses of last year. But this Session a further step has been taken owing to the action of the Brighton Corporation, and a special compensation clause has been passed by Parliament and I believe will be inserted in all Bills to be passed this Session. The effect of that clause will be that the Board of Agriculture or Court may cause compensation to be paid where wrong has been done to a dairy farmer through the local authority having dealt wrongly with his milk supplies. Thus we have the principle of compensation affirmed by Parliament. But these Acts, with the special compensation clauses of this Session, will not apply to the Acts passed last Session or in the Session of 1899, so that we have a large number of Corporations in all parts of England having different regulations. That state of things tends very much to the detriment of the dairy farmer, who does not know where he stands, and it is also to the detriment of a large number of the poorer municipalities of this country, who cannot afford the expense of a private Act of Parliament. Therefore I submit that the time has arrived when the Government of this country should take this question up and place it upon a basis which will be uniform, applying it to the whole of this country, and put an end to the unsatisfactory piecemeal legislation which now prevails in connection with so important a subject.

Professor McWeeney, of Dublin, said: I have unfortunately been prevented by the business of my own Section from coming here at an earlier period, and I have not been able to make myself acquainted with the course of this discussion. I will therefore confine myself to laying before you the results of certain experiments which I have made upon two points: first, as regards the accuracy of the tuberculin test as applied to bovine animals, and secondly, as regards the infectivity of the milk of cows which, although clinically sound, give a positive reaction when tested with tuberculin. I will just merely mention the bare facts, leaving you to draw the deductions. I have tested a herd of 88 milch cows, all of which were kept under the best hygienic conditions and seemed to be in perfect health. They were kept in the neighbourhood of Dublin. Out of these 88 cows I got 46 positive reactions. The arrangements under which the test was carried out enabled me to have the cows slaughtered a fortnight after the injection was made, and I was able in every case to subject the reaction to the test of post-mortem examination. The result was to bring me to the opinion that when the reaction had been positive, and when at the autopsy I failed to find tuberculous lesions, it was because my autopsy was incomplete. So generally did I find them to be present, and so often did I find them on more careful examination when they did not at first appear, that I was led to that conclusion. These animals were killed by the butcher for human food, and, as you are all aware, it is under those circumstances not always possible to make a complete examination. The total number of exceptions in the 46 cows were only two or three in number, and I am so convinced of the accuracy of the test that unless I were able to cut up the animal piecemeal and examine the epiphysis of the joints and the cavity of the brain, I should be of opinion that the results were positive, that that animal was tuberculous, in spite of the fact that I did not find the lesions at the post-mortem examination. I consider that all the 46 which gave the positive reaction were tuberculous. As regards the negative reaction, when tuberculosis was found at the autopsy, that also took place on occasions, and I confess I am not able to give an explanation of it. It is well known that when the disease is in an advanced state the animal's system may be so saturated with what might be called self-produced tuberculin, tuberculin produced as the result of the local activity of the tubercle in the body, that the animal may be in such a condition of auto-toxication that the introduction of further tuberculin may not produce any reaction. But the couple of cases in which I did not find tuberculosis did not come under that category. I am not able to give any explanation for that, except perhaps there might have been a failure in the injection. The injection of course is an operative procedure, and there are such things as needles becoming bent and the material being scattered through a skin puncture leading it outside the skin. I did not myself carry out the injection, so that I cannot absolutely include that source of error. As regards the distribution of the lesions, the bronchial glands and . . . glands, especially the long posterior . . . glands, were in most cases the seat of the disease; next to them came the lungs, then the pleura, and then the glands

at the root of the liver. As regards the infectiveness of the milk of cows of this kind, I selected five cows apparently in the best of health, but giving distinct reactions to tuberculin, and I collected their milk under antiseptic precautions, always excepting the last litre of milk from the udder. This milk I drew off into a sterile vessel and placed it in a sterile funnel for twenty-four hours, and after that twenty-four hours I drew off the last few centimetres by means of a tube. I then centrifugalised this milk for half an hour in a steam centrifugal machine. In this way I obtained the whole of the sediment of a litre of milk in the space of one cubic centimetre, and this I injected into the subcutaneous tissue of the thigh of a guinea-pig. Into the other thigh I sometimes, but not always, injected some of the cream from the same milk. It is one of the gravest faults in a research of this kind that you generalise upon too small a basis to observe facts, and these experiments have not been sufficient to enable me to give a positive opinion as to the results. All I can do is to lay before you the number of experiments and leave you to draw your own conclusions, if any conclusion indeed can be drawn. I have at present operated on a good many animals, but only sixteen of them have been sufficiently long injected for the results to become positively known. In not one of these sixteen cases did I obtain a positive result. I lost none of my animals from septicæmia, and not one of them contracted tuberculosis. On the other hand, by way of a control experiment I selected some pieces of tubercular material which I had microscopically demonstrated to be exceedingly poor in bacilli. One piece I took from the caseous centre of a scrofulous gland of a child, the gland having been removed in a hospital, and the other piece of material I selected was a small piece of caseous matter from a chronic tubercular abscess in the lobe of one of the cows whose milk I experimented with. In none of these animals was I able by a fairly long microscopical examination to find a single bacillus. I powdered up a little material, dissolved it in milk, injected it in a subcutaneous tissue of the thigh of guinea-pigs, and killed them. As a matter of fact it was not necessary to kill them. Both of them had well-marked signs of tuberculosis. These then are the results of the experiments, and I wish to point out that as yet they are not sufficiently numerous to be conclusive, and that in any case positive results have a greater logical value than negative ones. Up to the present, at any rate, my results have been of a purely negative character.

Mr. J. A. W. Dollar, in reply, said: I thank you for the extreme toleration you have shown to some rather controversial points in my Paper. I cannot help thinking that a certain part of that tolerance is due to want of evidence to convict me. A distinguished representative from Belgium brought forward a point regarding goats, which he stated I had represented as being almost as susceptible as cows to tuberculosis. It is a mistake. I pointed out that it was a fallacy to suppose that goats were exempt. I can immediately dispose of the point by reading to you a few lines on the subject contained in my Paper:—"The common use of goats' milk as a diet for young children demands the exposure of the dangerous fallacy that goats are

immune against tuberculosis. Eichhorn states that his attention was called to a herd of twenty-eight goats, in which one had died of advanced tuberculosis. He then tested the remainder with tuberculin. Nineteen showed a reaction of more than 1° C. Two of these were slaughtered and found tuberculous. Siegen found ten cases of tuberculosis among goats at one of the Luxembourg slaughter-houses. Cadiot, Gilbert, and Rogers have shown the goat enjoys no immunity against the disease. The use of goats' milk must therefore be subject to the same precautions as that of cows." I merely indicated the fact that goats were not immune, without going into the question of the relative degree in which they suffered as compared with cows. If any proof is wanted that goats are not immune it would be well afforded by the experiment which Professor Nocard has carried out, and which I have myself repeated on his behalf and instance, on milch goats. If one takes a small quantity of tuberculous milk, and after stripping the udder injects some 3 or 4 cc. into it, one will see in the course of a fortnight a development of characteristic tuberculous mastitis. Under Professor Nocard's directions, I carried out this experiment for the purpose of affording a demonstration to the Congress of the facility with which portions of the udder could be removed with a harpoon for the purpose of investigation. Owing to a circumstance over which I have no control I am not able at the present moment to produce the goat. A distinguished member representing the dairy trade pointed out to us that dairymen were if anything more healthy than their fellow-creatures; in fact, the exercise of this business appeared to have a distinctly favourable effect. I should like to point to the investigations which have been carried out by Professor Nocard and Professor Boltry in France. There it is the custom for attendants on cows to pass a very large proportion of their time in the cowsheds, and, with the characteristic French economy, they assemble in the cowsheds during the winter for the purpose of passing the evening, and many of them sleep in the hay-lofts or lofts communicating with the cowsheds. A careful investigation of the mortality amongst these persons reveals the fact that from three to four times as many die from tuberculosis as die in the rest of the neighbouring population. I think there can be little doubt there is a direct relation of cause and effect between those two circumstances. Professor Axe stated that the incommunicability from animals to men had not been clearly demonstrated as a scientific fact. That statement has been so carefully and fully dealt with by Professor McFadyean that I do not think it is necessary for me to go into it, but I may point out that in a very early portion of my Paper I drew attention to the fact that the transmissibility of tuberculosis from animals to men necessarily may not be made the subject of experiments, and then I went on to say that a number of reported cases existed which have almost the force of experiments. I am quite at one with Professor McFadyean in believing that it is impossible for us locally to carry out experiments giving the final and definite scientific proof, inasmuch as we cannot experiment on man; but still, there is so large a mass of evidence regarding the communicability of bovine tuberculosis to man, that we are under the necessity of taking every possible precaution. I believe the

majority of persons are fully satisfied that bovine tuberculosis is communicable to man. Another speaker dwelt on the advantages of out-of-door life, and I believe Professor Bang very clearly drew attention to the fact that, after all, the question is one of the existence of the bacillus—that is to say, contagion or no contagion. But this question of out-of-door life is especially interesting to me, inasmuch as when Mr. Gilruth, M.R.C.V.S., the bacteriologist to the Government of New Zealand, was last in this country he entrusted to me a large amount of documentary evidence bearing on that very subject, of which I may give you the substance. Queensland should be an ideal place for cattle. The temperature is high almost throughout the whole year, and during the summer rises to over 100 in the shade. The climate is exceptionally dry, so exceptionally dry and hot that persons working there are in the habit of using gloves to shelter the hands from the immediate rays of the sun. The animals are never housed, and the only time in which they come in contact with men is when they are being rounded up for identification and branding. One would think that under these circumstances we should have no tuberculosis whatever, and yet we have received from a member of the Royal College of Veterinary Surgeons, who acted for some twelve years as inspector of one of the largest of the slaughter-houses in Queensland, statistics showing that in his examination of cattle he condemned carcases to the extent of 15 to 20 per cent. for tuberculosis, and I need scarcely point out that that indicates a very much larger proportion of tuberculosis than the figures appear to show; because, necessarily, the inspector would not condemn every case of tuberculosis that came under his notice for meat purposes. There seems, so far as I can gauge the opinion of this meeting, a very general consensus of opinion on several points. One is, that there should be a periodical inspection of dairies and cows by veterinary surgeons. The second is, that cows with tuberculous udders should be slaughtered, or, at the very least, should be strictly segregated, and I believe the majority are in favour of slaughter. The third point on which there is a general agreement is that compulsory and common legislation should be made for the whole country, and there is a very strong refusal to finally accept Dr. Koch's statement as to the incommunicability of tuberculosis from man to animals, without much further and more sweeping experiments than have hitherto been adduced. With regard to the other issue which has arisen in consequence of Dr. Koch's statement—namely, the incommunicability of bovine tuberculosis to man—I think the general feeling of the meeting is that until much more conclusive evidence is brought before us than has been hitherto adduced we ought not in any way to relax our efforts, and that every precaution should be taken, and that we should persevere in the direction in which we have been hitherto working to obtain legislation dealing with the inspection of milk and the inspection of meat. (Cheers.)

(The Section then adjourned).

The Third Sitting of the Section was held on Thursday, July 25th, Sir GEORGE BROWN, C.B., being in the Chair, and the subject for discussion was:

TUBERCULOSIS AND THE MEAT SUPPLY.

Mr. JAMES KING, M.R.C.V.S. (Chief Veterinary Inspector to the Corporation of the City of London), in opening the discussion, said:—

On being asked by your Secretary to open this discussion on tuberculosis and the meat supply, I must say that at first I felt very reluctant to undertake it, my opinion being that it might have been placed in more able hands. However, having exceptional opportunities of making post-mortems on our food animals, after duly considering the matter I acceded to his request, in the hope thatby so doing I might be able to give this Congress an idea of the prevalence of the disease and the enormous loss to the country through its ravages.

The subject that we have met to discuss to-day is one of great moment, not only to the meat-trader, but also to the profession generally. Tuberculosis is the cause of great loss and dissatisfaction to the farmer and also to the meat-trader; so much so that many of the latter, after endeavouring to the utmost to follow the trade of their ancestors, and to deal only in home-fed meat, have found themselves compelled, through losses arising from disease amongst their cattle, to abandon it. The cases are rendered the more trying since neither expert nor trader can by ordinary inspection detect the malady in open market. Inspection is now becoming more general, and better trained and more qualified officers are appointed than was the case formerly. The Health Acts, too, are more stringent for the protection of the public. The butcher therefore concludes that, as there is no Act to protect him, and the passing of an animal by a veterinary inspector in an open market is no guarantee that what he purchased at a good price as sound and fit for human food will turn out to be so, or that money value will be realised, what is considered in his case as a trade risk is much too great. He therefore finds it necessary to protect himself by leaving live cattle alone and obtaining his supplies from the dead meat markets. Here he can select what suits his trade, without fear of confiscation and prosecution by reason of tuberculosis. In our dead meat markets the home-fed meat has to compete with the foreign, which may be home-killed or otherwise, and if the supply of the former be limited or the price not suitable, the butcher is tempted to purchase the latter, and invariably finds that he can do so to advantage. The quality may be only slightly inferior or possibly equal to that for which he had been accustomed to take so much trouble and run so much risk. He consequently continues to purchase the foreign and his customers become educated to its flavour. Thus, to the great detriment of our home supply, he may be able to

furnish them with apparently as good a joint at less cost, for once the price of meat has been reduced it is difficult to raise it again.

This seriously affects the farmer and the tradesman, for in the first instance the home animal has to be raised and fed at considerably greater expense than its foreign competitor, and the butcher, in addition to the risk of losing the carcase through its being subject to tuberculosis, finds it harder still to make his purchase at a rate which will protect him from serious loss. He knows from experience that, no matter what class or breed he may buy, the risks are identical. His ox may cost £30, and yet after slaughter, not infrequently the carcase is found to be so extensively pervaded with tuberculosis as to render it unfit for human food, and it therefore has to be condemned.

It is common knowledge that a very large percentage of cattle in our best herds are subjects of the disease, and further that it is impossible by ordinary examination to find any clinical evidence of the malady. I have had occasion to make post-mortem examinations of some of the best cattle our country produced, and which were exhibited as such at our principal shows. After slaughter it has been absolutely necessary to condemn parts of them for tuberculosis. This has been a well-known fact for many years past, and yet nothing of any consequence has been done to check the prevalence of this scourge, although it is generally admitted to be one of the sources of infection to human beings, and the means of mitigating the evil are placed in our hands. A few stock-holders, capable of affording it, have made voluntary attempts to remedy the state of things, but their small efforts, although demonstrating what might be done if powers were granted by Act of Parliament, do nothing to effectually check the ravages of the disease, or to restore the lost confidence of our meat-traders. To these agriculturists must look, for unless they can find purchasers for their cattle at remunerative prices, it is of no use for them to rear and feed stock.

I have been a veterinary inspector now for over ten years, and for six of them I had the supervision of a large provincial meat-market. From careful observation I have come to the conclusion that there is a growing demand for foreign meat, and a corresponding decrease as regards home-fed. The reason given by the salesman is invariably that the loss is so great through having the carcases of home-fed cattle condemned on account of their being affected with tuberculosis, that they are driven to the purchase of the foreign. Surely, this being the case, it points to the necessity for some action being taken by the Government. To realise the extent to which some of our cattle suffer from this disease it is necessary to be present when they are slaughtered. Sights are then seen which make one wonder how, large as the death-roll is from this cause, the disease is not more prevalent in human beings, and the urgent need for proper and systematic inspection under definite laws relating both to live animals and carcases, together with State aid by way of compensation, is obvious.

With the object of ascertaining, as nearly as possible, the percentage of cattle affected with tuberculosis, the loss to the country, and the quantity of meat

rendered valueless to all concerned in the matter, I have made searching post-mortems, as follows :—

TABLE I.

Result of the Post-Mortem Examination of 1738 Animals, consisting of Cows, Bulls, Oxen, Heifers, and Calves.

	Cows.	Per Cent.	Bulls.	Per Cent.	Oxen.	Per Cent.	Heifers.	Per Cent.	Calves	Per Cent.	Total.
Number of carcases and organs examined	500	...	113	...	131	...	53	...	941	...	1738
Number free from disease	266	53·2	93	82·3	116	88·55	42	79·24	929	98·72	...
Number tuberculous .	234	46·8	20	17·7	15	11·45	11	20·75	12	1·27	292
Number with lesions in abdominal and thoracic regions. .	129	25·8	9	7·96	9	6·87	8	15·09	...	...	155
Number with lesions in thoracic region only	87	17·4	7	6·19	3	2·29	3	5·09	...	...	100
Number with lesions in abdominal region only	18	3·6	4	3·0	3	2·29	...	...	...	...	25
Number with lesions in mammary glands .	11	2·2	...	...	...	...	...	...	...	...	11
Number with lesions in testicles . . .	...	...	1	·87	...	...	...	...	...	...	1
Number of carcases affected	67	13·4	5	4·42	6	4·58	5	9·43	5	·53	88
Number of carcases totally destroyed .	35	7·0	3	2·66	1	·76	1	1·88	2	·21	42
Number of carcases partially destroyed .	32	6·4	2	1·77	5	3·81	4	7·54	3	·21	46

Note.—All percentages calculated on the number of carcases examined.

TABLE II.

Weight and Value of Meat and Viscera Destroyed.

	Weight of Meat in Lbs.	Price per Lb.	—			Number of Whole Viscera destroyed.	Price Each.		—		
		d.	£	s.	d.		s.	d.	£	s.	d.
Cows	16,832	@ 4	280	10	8	129	16	6	106	8	6
Bulls	2,376	@ 4½	44	11	0	9	16	6	7	8	6
Oxen	1,152	@ 5½	26	8	0	9	16	6	7	8	6
Heifers. . . .	748	@ 5½	17	2	10	8	16	6	6	12	0
Calves	480	@ 4½	9	0	0	2	5	6	0	11	0
Total . . .	21,588	...	377	12	6	157	...		128	8	6

TABLE II.—*continued.*

Weight and Value of Meat and Viscera Destroyed.

	Number of Abdominal Organs destroyed.	Price Each.	—	Number of Thoracic Organs destroyed.	Price Each.	—	Total Value.
		s. d.	£ s. d.		s. d.	£ s. d.	£ s. d.
Cows . .	18	14 0	12 12 0	87	2 6	10 17 6	410 8 8
Bulls . .	4	14 0	2 16 0	7	2 6	0 17 6	55 13 0
Oxen . .	3	14 0	2 2 0	3	2 6	0 7 6	36 6 0
Heifers .	...	...	...	3	2 6	0 7 6	24 2 4
Calves. .	10	2 6	1 5 0	2	3 6	0 7 0	11 3 0
Total .	35	...	18 15 0	102	...	12 17 0	537 13 0

The above condemnations have been made in accordance with the recommendations of the Royal Commission on Tuberculosis. What the loss would amount to if the carcases of all animals affected with the disease were destroyed, as is recommended by some authorities, I leave you to conjecture.

With reference to the above tables I have taken great care to see that all the meat condemned was weighed, with the exception of the calves, and the figures enumerated are taken from average wholesale prices in the trade. In estimating the prices of viscera I have taken the figures from wholesale prices given by offal contractors, plus the price of fat, averaging 4 stone per beast at 1*s.* 6*d.* per stone. This is always destroyed with the viscera in cases of tuberculosis. The figures in the table relating to calves were obtained from Mr. W. F. Shaw, F.R.C.V.S., who made the post-mortems on behalf of the Local Government Board, in order to ascertain their freedom from tuberculosis. The whole of the carcases were inspected by me, and although a record of those affected with the disease was kept, their weight was not taken. I have, therefore, simply given an ordinary average weight.

In addition to the loss sustained, as set out in Table No. 2, to form a proper estimate of the cost of this disease to the country, it will be necessary to include the amounts paid by local authorities for destroying such affected meat and offal, in order to comply with the Public Health Acts. These statistics would be very difficult to obtain, but would, I may mention in passing, total up to no small amount.

Taking figures from the annual returns of the Board of Agriculture for Great Britain under the Diseases of Animals Acts for the year 1899, which is the last supplied me, I find that the estimated number of cows in Great Britain was 2,670,260, and taking the average life of a cow at seven years, it may be argued that one-seventh of that number is killed annually—viz., about 381,608.

Therefore, if from the above table the percentage of those so affected with the disease as to render the carcases, etc., partially or totally unfit for

human food be taken, we find by the simple rule of three that if a loss on 500 cows be £410 8*s.* 8*d.* the annual loss on cows will amount to £305,067.

For the purposes of this paper, let us now take the numbers from the same returns under the heading of "Other cattle aged two years and upwards." This will include the bulls, oxen, and heifers referred to in my table, as those were over that age. The number given by the Board of Agriculture is 1,341,310, and calculating the average life of that class to be three years, one may estimate that one-third of that number is slaughtered annually—viz., 447,103. Therefore, by taking the percentage of those affected with the disease, as shown by the table, we find by the same deduction that if a loss on 297 be £116 1*s.* 4*d.*, the annual loss on cattle under this heading will amount to £174,726, making a total annual loss through this disease of £479,793.

It is not necessary to take the loss in calves, as the percentage of disease amongst that class is so small that it may be looked upon in the ordinary course as a trade risk, and need hardly have any effect on our meat supply.

Can it be wondered from the foregoing figures (although approximate) that the trade in foreign meat has made such enormous strides within the last few years?

If we refer to the agricultural returns of the Board of Agriculture for 1900 we find that under the head of fresh meat imports it is reported that a quota which formed only one-fifth of a single pound per unit of the population in 1866–1870 has expanded to little short of 20 lbs. per head on the average of the five years 1896–1900, and has touched 22·5 lbs. per person in the single year 1900, an instance of progress quite out of all proportion to the development of other forms of imported food.

On again looking at the returns of the total number of cattle in this country for the last ten years, we find that the year 1900 shows a decrease, as compared with the year 1891, of 47,821. These figures denote that, although our population is steadily increasing, as are also our meat-eating propensities, nothing is being done to supply the increased demand with home-fed cattle. In our live-stock markets at present, although returns show that supplies are not so plentiful as in previous years, there seems a difficulty in salesmen realising profitable prices for beef cattle.

In conclusion, I am convinced from personal observation that the principal cause for this state of things is tuberculosis, and we are not improving it by our present voluntary efforts to purify some of our stock by the use of tuberculin, as this undoubtedly throws a much larger number of known tuberculous animals on the market, and increases the risks of the butcher, and thus making the purchase of home animals more of a gamble than a legitimate trade. Is it then surprising that he purchases foreign meat to supply his customers instead of the home article?

I have endeavoured to place before you in these few remarks as clearly as I can in the time allowed the present state of affairs, which has now been going on for years, and there can be little doubt that the cause is on the increase. I cannot conclude without asking how long this will be allowed to

continue in our midst before any active steps are taken to eradicate, or even reduce, the prevalence of this disease.

The Chairman, Sir GEORGE T. BROWN, C.B., said: It will probably simplify matters if I make a few remarks in connection with the proceedings this morning. The discussion which has just been opened is a very important one, and I do not think any of you can possibly complain that it is not thoroughly practical from beginning to end. (Hear, hear.) One point I wish particularly to insist upon is that there will be no advantage gained by a number of speakers merely complaining of the hardships which are inflicted, because we know all about them. In the course of two Royal Commissions it would have been hardly possible for me, if I had known nothing of the matter before, not to be perfectly familiar with all that could be said about it at this moment, and if you have read the last report, which very few of you have probably seen, you will observe that we thoroughly recognise the extraordinary irregularities which occur in meat inspection—(hear, hear)—the utter want of system which led the writer of the report to say that the whole thing could only be compared to chaos. It happened, oddly enough, that Mr. King's predecessor adopted the rational course which the Commission recommended. He did it spontaneously. Another inspector of an equally large market followed him as a witness. To both of them I put the same question: "If you met with an animal with localised tuberculosis in the lung, liver, or bronchial glands, would you condemn the whole carcase?" "Certainly not," he said, "I never did such a thing in my life." Then came the other man, and the same question was repeated by the same person, myself. The answer came, "If I saw a spot of tuberculosis anywhere about the animal the size of a small nut, I should condemn the whole carcase." (Laughter.) I said, "Why would you do it?" and he gave me a rational answer. Most of them said they did not know, but he said, "I take high ground: I cannot say that an animal with a single tuberculous nodule is perfectly safe, and therefore I condemn it." In the course of our recommendations we marked out certain lines which Mr. King tells you he follows, but there is an immense number of meat inspectors all over the country who do not follow them, and that is the difficulty you have to deal with. I want to make you understand that it is no use occupying much time in telling us of this fact, as we all of us know it, and so far as Royal Commissions can do anything, so far as recommendations can do anything, it has all been done. How to stimulate the authorities who are concerned to do it I do not know, and if any of you happen to possess the secret we shall be only too glad to get it. I do not think there is any good in saying that certain regulations ought to be made, unless at the same time you can point out to us how. I have no doubt we shall make some recommendations from this Congress, but for my own part I share Mr. King's apprehension that, like the majority of recommendations, they will remain a sealed book. Not only are they not acted upon, but I think in this particular case the majority of meat inspectors throughout the country have never even read the report which contains those recommendations, and therefore cannot

be accused of wilfully neglecting them. It is possible that as there are a number of gentlemen here interested in the meat trade they will be anxious to make their complaints known. I say, if you have to complain of injustice in the world, hit hard in a few sentences, and tell us exactly what you want, and, if you possibly can, how you think it can be remedied. (Cheers.)

Mr. J. BOWEN-JONES, of Shrewsbury, said: First of all, let me congratulate Mr. King upon the very excellent and practical Paper he has laid before this Congress. As far as I can follow him, I agree with his conclusions in every respect. I am not to-day going into the general question that we touched on rather fully yesterday, but I want to put forward a few propositions which I believe would lead to practical legislation without any great disturbance of the existing law. In order to get that practical legislation you must endorse and support, not only in this room, but all over the country, the views that you approve of, and by that means alone, by pegging away, by forcing upon public opinion the justice of your cause, you will find the only way by which you can arrive at the means of rectifying matters, which is what our Chairman has just asked us to do. Any legislation that is not founded on incontrovertible facts with regard to disease is, in my opinion, out of the question. (Hear, hear.) I say that more particularly in reference to the tuberculin test. Such legislation would not be sanctioned either by the traders or the owners of stock, because they are perfectly well aware that under it, if the tuberculin test was to be relied upon, their herds would be decimated. Neither would any Government, under the circumstances, be prepared to provide the enormous amount of compensation for the slaughter of animals or for the seizure of carcases which we advocate, which I propose in the suggestions I am going to put forward, because it would be impracticable to find the money, especially at the present time. On the same grounds I come to the conclusion that it is absolutely useless to make any proposition that tuberculosis shall be scheduled under the Contagious Diseases Act. With those few remarks I will now put forward the propositions which I have prepared with the assistance of many eminent authorities connected with this question, not only belonging to the agricultural interest but to the commercial interest of this country, and submit them to this meeting for your criticism, approval, or condemnation. I begin with the recital of the present law with regard to the dealing with meat in England, and I will read it just to show how the case stands now. It is recited in the Report of the Royal Commission that Sir George Brown took so active a part in. Paragraph 20 of the Report of the Royal Commission on Tuberculosis states that "the provisions of the general law with respect to the inspection of meat in England and Wales outside the Administrative County of London are contained in the Public Health Act, 1875, and the Acts incorporated with it. Sections 116 to 119 of the Act of 1875 enable any medical officer of health or inspector of nuisances to inspect and examine any animal, carcase, or meat exposed for sale, or deposited in any place for the purpose of sale or of preparation for sale, and intended for the food of man. If it appears to him to be unfit for

human food he may take it away to have it dealt with by a justice." You will notice that that is only an enabling Act, and I want a compulsory Act. I want it to be made compulsory on the local authorities that they must inspect and seize tuberculous meat. I should like to propose it as a resolution, but I will leave it, as it will not be put to this section, but will come on probably elsewhere. I propose: "That this Congress is of opinion that it is desirable the General Law should be so amended as to compel county, county borough, and other local authorities, to periodically enter and examine, by means of qualified inspectors, all places within their respective jurisdictions, used for the sale of butchers' meat, or the slaughtering of cattle. And if upon such examination any animal, carcase, or meat exposed for sale, or deposited in any place for sale, or of preparation for sale and intended for the food of man, is found to be affected with tuberculosis, to take it away and have it dealt with by a justice." You will see that that clause embraces not only dead meat but live animals that are suffering clearly and visibly from tuberculosis. My second proposition is: "That the owner of any animal or carcase or meat confiscated and destroyed wholly or in part by order of a magistrate shall receive full compensation and repayment of the amount paid by him therefor, provided—

"(a) That the magistrate ordering confiscation shall satisfy himself that the animal had a good appearance before slaughter, was well nourished, and exhibited no visible signs of tuberculosis.

"(b) That no compensation shall be paid for any animal for which there has been paid less than a minimum price to be fixed from time to time by the Board of Agriculture according to the market values current, nor in excess of a maximum price, to be fixed in the same manner.

"(c) That no sum shall be paid in compensation except on the order of the magistrate ordering the confiscation of the carcase.

"(d) That all compensation so ordered shall be charged against and paid from Imperial funds."

I then go on, "That the administration of the law with regard to seizure and confiscation be made equal and uniform." After what our Chairman has said I think it is unnecessary for me to dilate on that. I then continue: "That, as recommended by the Royal Commission (p. 21, par. 6), the Local Government Board be empowered to issue instructions prescribing the degree of tubercular disease which should cause a carcase, or part thereof, to be confiscated. That the owner of the animal, carcase, or meat confiscated shall have the right of calling rebutting evidence in case of confiscation."

That is only fair and equitable, and what every honest mind would think right. I contend that the effect of these resolutions, if made into compulsory law—and I hope that the weight of this Conference will in the fullest degree cause legislation to take place at a very early date—will be that the consumer will be protected from injury. The disease will certainly be appreciably reduced, and for my part I have no objection to voluntary efforts being made through the tuberculin test, or any other means, by isolation, by boiling the

milk of calves, and by the many remedies which have been suggested for the extermination of tuberculosis being put into force. But I say, let them be compulsory, and let us induce the Government of the country to pass these practical propositions and make them law to the advantage, not only of the breeders, owners, purveyors of cattle and purveyors of meat, but to the public at large.

Mr. WILLIAM FIELD, M.P.: May I ask whether you intend, Sir, to put that Resolution to the meeting, because if so, I should like to have an opportunity of seconding it?

The CHAIRMAN: I am going to attend a meeting this afternoon of the Congress in order to decide what resolutions will be laid before the general meeting, and Mr. Bowen-Jones's resolution of to-day and yesterday will be laid before them.

Mr. WILLIAM COOPER: Do I understand that only such resolutions agreed upon by you in this way will be allowed to be put forward as resolutions of the Congress?

The CHAIRMAN: I cannot tell you. I am instructed to attend that meeting, and that is what I intend to do; but there is nothing to prevent any member sending in any statement he likes.

Mr. WILLIAM COOPER: If I might be permitted to say a few words thereon——

The CHAIRMAN: No resolution of any sort or shape will be put from this Chair as long as I sit in it. It is not my business to take resolutions; if it were, we should require at least a month to get through our work.

Mr. WILLIAM COOPER: I agree, but may I make some observations with regard to Mr. King's Paper, which, I take it, is before us?

The CHAIRMAN: Certainly.

Councillor ANDERSON, M.D., of Glasgow: Might I ask that the Paper which Mr. Bowen-Jones wrote, and of which I see other members have a copy, should be distributed to the other members of the Congress, so that we might know exactly to what we are asked to assent?

The CHAIRMAN: This is written by Mr. Bowen-Jones, and if I gave you this copy I should have none for myself.

Mr. WILLIAM COOPER: Am I in order in making a few observations?

The CHAIRMAN: When I call your name out, which I will do in proper order.

Mr. MORGAN HOPKINS: I do not think it would be wise on my part to take precedence of the gentlemen who have been appointed by my trade, and I would like to defer to my friend Mr. Field, who is a Member of Parliament, and follow him at a later stage.

The CHAIRMAN: I know Mr. Field quite as well as you do, and as I have called your name you must speak.

Councillor ANDERSON: Might I, as a delegate, receive the particular propositions which have been put before us? I do not think it is fair that there should be typewritten or printed communications placed before this Congress, and that as a delegate I should not have an opportunity of studying them.

Mr. A. C. COPE (Board of Agriculture): This is the proposition prepared by Mr. Bowen-Jones, and he has been kind enough to leave a copy of it with Sir George Brown. If you wish a copy of it, the best thing you can do is to ask Mr. Bowen-Jones to give it to you.

Councillor ANDERSON: I understand the gentlemen in front of me have copies, and I see them all over the hall. (No, no.)

Mr. A. C. COPE: It is most likely a friend of Mr. Bowen-Jones who has given them to the members, if they have them.

Mr. MORGAN HOPKINS said: I must really apologise for taking precedence over the men of our federation, and especially my friend Mr. Field, who is an able Member of Parliament; but I obey the command of the Chair, and would like in a very few words to give the opinion of a practical butcher upon the methods adopted, and to refer to the paper so ably prepared and read by Mr. King. If every corporation throughout the United Kingdom had such inspectors of meat as the London Corporation is fortunate in possessing, I do not know that the trade of which I am a member would have great cause to complain of the manner in which they are treated. But unfortunately, as Sir George said, the majority of our so-called meat inspectors, professional gentlemen, members of your profession, Sir George, have not opened the Report of the Royal Commission on Tuberculosis, and have not seen that very instructive paragraph where you have laid down that if the disease is simply localised the carcase should not be destroyed. They have not even read that portion of the Report, and have simply taken upon themselves, if certain portions of the carcase are affected, to say the whole must be destroyed for the purpose of protecting the public. I think Mr. Bowen-Jones, who is one of our leading agriculturists, and who has taken a prominent part in advocating the cause of agriculturists, has really crystallised in a very few words the opinions that have been expressed at many meetings of our trade, that compensation should follow confiscation. That is the great, broad, basic

principle on which we are standing. This, after all, is really a humanitarian question. The people attending this Congress are drawn to London to-day for what purpose? To try and save humanity from this horrible disease. The great scientists of our day have laid it down as a rule that this disease is propagated by the eating of meat and the drinking of milk. What do they suggest? The destruction of the meat in question. And who is to be the sufferer? The people engaged in those respective trades. Is it right, is it fair, is it equitable, that the country at large should expect the trade to be the saviours of mankind from this disease, and that the trade is to suffer in consequence? Decidedly not. If this meat is to be destroyed for the public good the public should compensate the man engaged in the trade; and as Mr. Bowen-Jones stated, I am not here to defend men who are engaged in the traffic of bad meat, inferior meat, or wasters—I am here as representing men who are honestly engaged in the trade, who are doing their level best to produce the best food for the consumption of the people. Why is it that commissions are appointed? Why is it that the public are burdened with the expense of commissions, if the reports are not read or entertained by our legislators? I appeal to the Congress that we, wherever we come from, should, through the medium of our Press, through the medium of our local authority, draft resolutions and petition Parliament in a thorough and concrete manner, demanding from Parliament recognition of the great principle of compensation. I believe in a great measure that is the difficulty under which we are suffering. To use a vulgar phrase, we are all tinkering with this great and important question; we do not face the difficulty in the manner suggested by Mr. King. Mr. King has dealt with it as a practical meat inspector; he has simply simmered down and put into his Paper the opinion of a man of many years' standing. If this Congress is going to justify its sitting here to-day we ought to pass such a resolution as Mr. Bowen-Jones has proposed, and this resolution should be conveyed to the meeting to be held to-morrow, and from that meeting to Parliament. We ought, and we have a right, to demand an honourable, fair, and proper compensation for the confiscation of our meat.

Mr. James Cameron said: I was unavoidably crowded out yesterday, and I should like very briefly to touch on one or two points of which I took note before. Sometimes it is a pleasure to give an opinion or an experience; on other occasions, it is painful to do so. I feel it is a painful, but at the same time a necessary duty, to add my testimony from personal knowledge to the communicability of *tabes mesenterica* from cow's milk to the child. Yesterday some veterinary surgeons alluded in rather deprecating terms to Dr. Koch. One part of Dr. Koch's remarks no one alluded to—namely, that with regard to disinfection of buildings and surroundings. I think we all have a lesson to learn upon that subject, and the following incident illustrates that. About three years ago I was asked to see a shepherd's cow on a farm in the country, and, it being dinner-time, others who had cows in the same byre naturally turned up, and before I gave any opinion, told me what was wrong

with the cow, and that she would die. They said that So-and-so's cow, which stood there before, was affected in the same way and died, and also the one before that died from tuberculosis in the same byre. But there is another aspect of Professor Koch's address. Supposing we grant, for the sake of argument, that there is not the communicability that there is supposed to be, and supposing an object-lesson was furnished by post-mortem demonstrations on a healthy cow with healthy organs, or on a few cows taken at random, not from hundreds, but from thousands of cows throughout Great Britain supplying the public with milk at the beginning of this week, what would the audience have said then? Words would fail to depict the horrified countenances which would be observed in the hall. That is no exaggerated statement—it is a positive fact. Reference was also made yesterday to the uniformity of inspection. There is a certain amount of comparative unanimity in regard to Edinburgh and some other large cities and large towns which have been able, through plenty of money and influence, to have private Acts of their own; but when you go to the whole county of Northumberland, the county of Berwickshire, and you may say the whole of Scotland, what do you find? The only harmony and unanimity that exists is simply the utter incompetence of veterinary inspection with regard to dairies and dairy cows. Who are the inspectors? The road surveyors and inspectors of nuisances. You cannot exaggerate that subject, because whatever you said you would be only bringing out the naked facts of the case. Another thing was alluded to yesterday, which goes a long way in popular opinion—namely, the health of dairy workers. Half of that argument was knocked on the head yesterday by the reference to human beings inhabiting cow-houses, and the other half by the explanation that the health of dairy-workers was in accordance with the old proverb, which says, "Early to bed and early to rise is wealth, health, and wisdom." The only other thing I wish to say a word upon is, that inspectors, both for milk and for meat, should be persons who have proved their qualifications for the work. No doubt the veterinary profession protests, and protests justly, against being excluded from the reasonable and proper position they should occupy; but many old veterinary surgeons, who have not had recent practical experience to any considerable extent, and no post-graduate course of instructions, would not be better inspectors of meat than some of the old doctors who occupy positions in small towns. Therefore, I suggest there should be a proper standard of up-to-date knowledge for all inspectors, both of meat and milk.

The CHAIRMAN said: Mr. Hopkins, I think, made some reference to the General Meeting, to be held on Friday. The meeting will be held in Queen's Hall, and anyone interested in the resolutions had better attend. Resolutions are carried by majorities, and the more who attend to vote for them the more likelihood of their being agreed to.

Mr. WILLIAM FIELD, M.P., asked: Will not it be very difficult to get a general hearing at the Queen's Hall meeting at three o'clock to-morrow?

The CHAIRMAN replied: I do not think you will have much trouble in making everybody hear you.

Mr. WILLIAM FIELD said: But I shall not get the chance of making myself heard, and I think these resolutions ought to be discussed here, even supposing they are not to be put to the meeting.

Councillor J. H. HEATLY, of Northumberland, said: I have very great pleasure indeed in thanking Mr. King for his excellent Paper. The subject is one of decided importance, and one on which I hope there will be an accurate deliverance of this Congress. I was particularly pleased, Mr. Chairman, with your remarks with reference to Dr. Koch's pronouncement upon the question. In my opinion he has put back the clock of Time twenty years, with his supposition of the incommunicability of tuberculosis from the lower animals to the human being. I think, as a public benefactor, it would be heroic on the part of Professor Koch if he were to submit himself to a process of tuberculous milk for a considerable period, in order to demonstrate to the public whether it is capable of effecting communicability or not. I come from the county of Northumberland, which possesses a unique experience. The town I represent is Morpeth. The county of Northumberland is certified by the medical statistics as the worst county in England for tuberculosis, and we stand in the unique position in Morpeth of being the worst town in England for tuberculosis. Our death-rate is something extraordinary. Time after time we have statistics from our medical officers of health, stating that *tabes mesenterica* is on the increase, and entirely due to the consumption of tuberculous milk. I came yesterday to talk about milk, but I shall confine myself now to meat, on your ruling, Sir. We cannot wonder at the dissemination of disease by meat, when so many animals suffering from the disease are exposed, as a great many professional men can assert. We have in our market on an average 1500 head of cattle exposed every Wednesday, and they are widely distributed over the county of Northumberland, and I believe the county of Northumberland is the largest cattle-producing county in England. There are no measures taken to prevent the spread of this disease, and no qualified inspection of meat. I do not know what the provisions are in Newcastle, but one thing I do know—namely, that the Chairman of the Butchers' Association in Newcastle, Mr. Dickinson, happens to be President of an association formed for the purpose of protecting the butchers against the introduction of tuberculosis. The County Council farm, which is in close proximity to Morpeth, last year sent the best heifer they had at their place to the Newcastle market, and on being slaughtered she was condemned for tuberculosis. The butchers in Newcastle formed this association, and with an annual payment of 10*s.* 6*d.* they are able to compensate each other, out of the funds of the society, for any animals seized in the district. (Cries of "No, no," and "Impossible.") I am only stating what is a positive fact. I have given you the name of the President of the Association, and you are at liberty to write to him. I do not say they compensate them in full.

(Hear, hear, and a voice: "They don't give them half.") You are under a misapprehension. The compensation is two-thirds of the value of the animal. (A voice: "It is impossible.") But they do it. You can easily verify my statement by writing to the President of the Association, Mr. Dickinson, Shields Road, Newcastle.

A DELEGATE remarked here: We don't doubt your statement, but we doubt the facts.

Mr. HEATLY replied: I am only speaking from Mr. Dickinson's declaration.

The CHAIRMAN said: Allow me to remark that I do not stand being played with at all on these occasions. If you mean to discuss the matter quietly, do so. I was about making up my mind that, at the conclusion of these meetings, I should have to thank my audience for having presented to me a phenomenal set of perfectly orderly, quiet, and sensible people. Every one of you, as far as time allows, will have an opportunity of talking, and if you will kindly agree with that magnificent statement of Carlyle's, that while speech is silver, silence is golden, especially when other people are talking, I shall take it as a personal favour. (Hear, hear.)

Mr. HEATLY said: Just one other remark, and that is, that I think it is necessary meat inspection should be by qualified veterinary surgeons. In our county it is impossible to ascertain whether anything is wrong. Frequently I have seen animals which we would naturally assume were diseased from their coming into the town at one o'clock in the morning. The natural assumption would be that there was something wrong. ("No, no.") All the slaughter-houses are private, and the result is that meat is exposed to the market without the slightest attempt at supervision. As Mr. Cameron said, in many towns and boroughs in Northumberland the road surveyor and sanitary inspector has control of the meat inspection.

Mr. MATTHEW BRECHIN said: I scarcely expected to be called on so soon to say anything in this discussion; indeed, I was determined I would not speak, but I intimated to the Secretary that I might have something to say. This year I happened to be President of the Glasgow United Fleshers' Society—in Glasgow we speak of them as fleshers, in England as butchers. I am a little surprised at a few things in connection with the Congress. I am surprised at many of the remarks to which I have listened. If there is one thing I have a weakness for it is figures, and when I heard a gentleman making the astounding declaration that an annual payment by butchers in a certain place will compensate even for two-thirds of the value of the cattle, I can only say that is something like nonsense. It cannot compensate, for the sum mentioned only means to the butchers of Newcastle an annual payment, roughly speaking, of from £300 to £500. We who know something of the

meat condemned know how far something like £300 or £400 can go in compensation. Regarding what has been said by Dr. Koch, I can say nothing, and do not propose to attempt to. But it seems to me that our veterinary surgeons and medical officers, responsible for the health of the community, will do wisely in considering seriously the possibility that Professor Koch may be right, and bearing in mind that it might be well in the interests of many persons that they should not be too drastic in the treatment of the subject. The fleshers of Scotland suffer in various ways. In Glasgow, as in Aberdeen, they seem to lose more from the condemnation of meat than they do in the City of London—(hear, hear)—certainly far more in proportion to the difference in the population. In Glasgow we do not complain very bitterly, although we should like more facility afforded us for defence. Any person who has in his possession meat which may be considered tuberculous, should have an opportunity of submitting it to competent authorities for the purpose of his defence. But we find that so recently as last week in Glasgow the veterinary inspector, at the request of the owner of a particular carcase, part of which was retained, flatly refused to give facilities to the owner and his advisers to inspect it. The name of that butcher probably is known to many here, Mr. Robb, and he was refused admission to inspect. ("No.") I make a distinct statement, and I am capable of proving it up to the hilt, but there is no need for argument, as you, Mr. Chairman, have already said.

A DELEGATE again said: I say no.

The CHAIRMAN remarked: You said no before.

Mr. MATTHEW BRECHIN: I have the greatest respect for one of our senior magistrates in Glasgow, but I am saying what I know to be perfectly true, and I refer to it for the purpose of bringing out this, that whatever is done in the interest of fair play and of all concerned, responsible officers should put no obstacles in the way of persons who are engaged in an honourable trade, and intend to sell nothing (as in this particular case happens to be true) but the very finest of meat. Every opportunity should be afforded to gentlemen such as he to prepare a defence if necessary. (Cheers.)

Dr. CARLO RUATA, of Perugia, said: I must apologise for presenting myself before you speaking a language that is not my own, but I hope I shall succeed in expressing my ideas, which I am sorry to say are a little different from the ideas that seem to be most prominent. Until two years ago I was tremendously afraid of tuberculous meat, so much so that at a Congress of Hygiene held many years ago I said that tuberculous meat must be entirely confiscated. Since then my hair has become white, and my opinion has altered a good deal, because I have examined the facts on which that opinion was formed. It is these facts I wish to put before this Congress, in order to see if they are accepted or rejected. If they are disproved it will be a lesson for me, and I shall be most thankful to you for teaching me. When we eat

meat it must produce intestinal tuberculosis: it cannot produce phthisis. Secondarily, we might have phthisis, but primarily it must be intestinal tuberculosis. I collected all the statistics in the world which are published by Governments and are reliable, and particularly the English statistics, and those statistics showed me that intestinal tuberculosis, *tabes mesenterica*, comes on exactly when meat is not eaten. I procured the official statistics of London yesterday, hoping to say something on the subject of milk, but through a misunderstanding I cannot say anything more on that subject, and I will confine my observations to meat. These statistics are only for the year 1899, and are to be found in the last annual Report published by the Registrar-General in London. They very much agree with Italian statistics. During the first year of life in London there were 3,208 deaths from *tabes mesenterica*; during the second year there were 1,100; in the third year, 366; in the fourth year, 164; and in the fifth year, 106. You will see there is an enormous difference between the first year and the other years. If we consider the statistics of later years we see that from five years to ten, that is, in a period of five years, there are only 325 deaths from *tabes mesenterica*, less than 100 a year, and the statistics go on to show figures from which we may conclude that during the next five years, although we have *tabes mesenterica*, it is an extremely rare disease. In my experience, which is a large one, I never found in post-mortem examination *tabes mesenterica* in adult people, but only the secondary condition, phthisis. This being so, it seems to me that before asking the Legislature to enact laws, we must be very prudent. Medical men during past years have been too hasty in asking Parliament to legislate. In my country we have laws which I consider thorough, and the authors of those laws are the medical and veterinary professions. When we ask for an enactment from Parliament there must be no scientific doubt on the question. If there is a little obscurity we have no right, and are not justified, in asking Parliament to legislate. I remember the reports of the first and second Royal Commissions, and I remember the experiments made on tuberculous meat given to animals. If my memory does not fail—Sir George will correct me if I am not right—it seems to me that in the experiment of Professor Sims Woodhead he gave the animals meat smeared with tuberculous matter. Well, we never eat such a thing. It may be that it will produce tuberculosis eaten in this manner, but we eat meat of a different kind. I accept the fact that raw meat can produce tuberculosis in animals, but allow me to say that at the beginning of every scholastic year I always say to my students, "Remember that in our experiments we always deal with animals; but when we have a result in animals we must not say that we shall get the same result in man." That is the great point. If in animals you find anything, you have no right to conclude that the same thing applies to man. Some experiments were made by myself and a colleague of mine, Professor Ruata, of Perugia. The experiments were made upon dogs. He fed dogs with tuberculosis for six months, and in about thirty experiments he never succeeded in obtaining a tuberculous dog. If you feed a cow we know that cows are very susceptible to tuberculosis, and the same applies to a rabbit; but even by feeding experi-

ments and obtaining intestinal tuberculosis in these animals you are not authorised to say that in man the same thing happens. There is another experiment by inoculation under the skin, but I assert that such experiments have not the least importance. We never inoculate under the skin in the ordinary course of life. If you do you break the line of defence which the skin provides. When we inhale or eat food we have inside of us the same defence that we have outside, and that is the great question.

Mr. WILLIAM COOPER said: I do not intend to detain you by any learned dissertation on the nature of tuberculosis, as I shall leave that to the learned gentlemen amongst us. What I, as a practical man, wish to ask is, What is the result of the present arrangement regarding the trade which I represent? I am a member of the Corporation of London, and also a member of the Cattle Markets Committee of that Corporation, and of course I have very great facilities for seeing the way in which the Corporation of London carry out the meat inspection of this great metropolis. We are fortunate in having such an able officer as Mr. King, and the Corporation of London have at all times taken the greatest possible care that all their officers are of the very highest class. They are paid well, and we look to get the very best assistance we possibly can obtain from such men. I should like to call your attention to what I consider to be the present condition of the law regarding seizures. I wish it were possible that the medical officers of health throughout this country—in whose hands principally the inspection of meat, or the responsibility for it, rests—could have a Congress amongst themselves and arrange one common line of action, so that we might have a uniform inspection throughout the country. (Hear, hear.) So long as we have men of such divergent ideas as obtain amongst many which we can mention, even in the metropolis, so long are we going to have an unequal and a most unfair inspection of meat. Certainly the law at the present time acts badly. When an agriculturist finds what he thinks is tuberculosis in his herd what does he do? He endeavours as soon as he possibly can to rid his herd of that animal. He sells it. There is a premium on concealment at the present moment. (Hear, hear.) I am sure we all know sufficient of agriculture to know that there is not an agriculturist in this country who can afford to go to the nearest medical officer and say, "I believe I have tuberculosis in my herd; will you come and see, and condemn and slaughter?" Who is philanthropist enough for that kind of thing? It is perfectly ridiculous, and the consequence is that we have a premium on concealment. If you could get some resolutions of the kind which have been proposed by my friend Mr. Bowen-Jones passed by this Congress, I venture to say that you would end this concealment by compensation. That is what we want, and that is our object in all these congresses and discussions—to do something practical, which will enable us to combat it. Now we are told in this section and other sections that we ought to follow the example of foreign countries. I am very much opposed to that. I believe we can learn very little indeed from foreign countries, and I will tell you the reason for my belief. I see a large

quantity of meat that comes from foreign countries to this country, and we know that a great deal of it after it comes here is seized as being unfit for human food on account of this very disease, and yet it bears the brand that it has passed an examination in that country. Surely we have nothing to learn from a country of that sort? I will make no concealment. There is Denmark. I believe there is no country in the world that suffers from the ravages of this disease more than Denmark. Owing to the condition of their climate they are bound to house their animals the greater part of the year in-doors, and that, I believe, is one of the great reasons for the disease. I will give you the experience of the Corporation of London regarding the imports of cattle to the Deptford Cattle Market. During the year we were able, by restrictions not being imposed on Argentina, to have a large importation of cattle from that country; we had scarcely one single case of tuberculosis. I think the cases we had were some animals that had been sent out from this country or some other country—probably France—and were not landed there, owing to the restrictions, because they did not pass certain tests. They had come back to this country to be sold, and those carcases were found to be tuberculous, and were condemned. The reason there was so little tuberculosis in the Argentine cattle was because the cattle there are on the open prairie and in a healthy condition. We are all aware that the open-air treatment is said by medical men to be the very best cure for this disease, for they say in its incipient stage it can be cured. I am sure the open-air treatment for cattle is the best. I am not going to tell you that in our climate you are able to keep your cattle out of doors all the year round, but I venture to think in many cases they may be kept out a great deal longer than they are without any trouble. That is an important thing. Then, above all things, we want uniformity of inspection, and we want the inspectors to be properly qualified men. We have been very much indebted to our friend Mr. Field for that very excellent return he obtained in Parliament with regard to the occupations of those individuals who were entrusted with the very responsible office of inspector of meat. We must look at it from their point of view. Many boroughs and district vestries, and so on, had very little in the way of meat inspection to do, and they did not think it was worth their while to get a properly qualified man, and the consequence was they attached it to some other office. The man who inspected the drains and looked after the sanitary work was called a meat inspector, although he had no qualifications for the office. He had to do it, and the result was what we could only expect, and sometimes a great deal of hardship was inflicted, and sometimes a great deal of inequality. An inspector walks into a butcher's shop, and sees something which may be seized. He calls in the medical officer of health, a very excellent medical man, but who has had no training with regard to diseased meat. We give these gentlemen credit for the scientific knowledge they possess, but if they are honest they will tell you that meat inspection is not their business and they know nothing about it. This man agrees with the inspector, and endorses the condemnation. What follows? They take it to the magistrate. Of all people on the face of

the earth I suppose there is no one more honest than a police magistrate. He says frankly that he has no knowledge of the subject; he hears what these two gentlemen have to say, and then he condemns the meat. The next thing is, if they are very zealous officers for the public weal, this poor fellow the butcher is hauled up before the Justice, and gets a penalty or imprisonment, exactly as he is lucky enough to get evidence in support of his case. He has no chance of getting rebutting evidence. The very fact that the article condemned has passed out of existence and cannot be brought into Court prevents him obtaining the evidence he needs. That is a state of matters that must not remain. Something in the law must be altered, and you will find Mr. Bowen-Jones has provided for that in his resolutions. That is the practical side of the question. We in London are better situated than many in the country with regard to inspectors. We are very careful, as far as the Corporation of London are concerned, that the men are properly qualified. One of the things we have insisted upon is that the younger men at any rate shall pass the examination of the Sanitary Institute, and our old medical officers of health also insist on this, that each and every one of the officers should be or have been a practical butcher, and should know something of the arrangements of an animal. I think that is a splendid qualification, and I think it would be much better if it were adopted more. We should have properly qualified inspectors. I am not going to discuss what took place before the Royal Commission. Many of their recommendations I entirely agree with. I wish the Minority Report had been the Majority Report, and I have not the slightest doubt, with all due respect to Sir George Brown, who was a member of the Commission, that if that body had been properly constituted and representation given to all classes who were interested, we should have had even more valuable resolutions than we did have. The consequence was that we had men on that Commission—I do not allude to my friend here, who is an even-minded man, and looks at all sides of a question—but we had some men whose views are very advanced, and I have not the least doubt that they prevailed on some of their colleagues to adopt the views which probably such a practical man as Sir George Brown would not agree with. If we are going to have another Commission, which there is a talk about, let us have a Commission which represents all parties—(hear, hear)—do not let us have a one-sided Commission consisting only of all the learned bodies in England, the veterinary profession, the medical profession, and so on, but let us have a few men as well who are connected with the practical administration of the food supply of this country. Surely there is not a man in this room or any other room that will deny that the supplying of the public of such a place as London with its five million inhabitants, and the Greater London beyond with the great many millions more, is a subject of the greatest importance to every person concerned. I heartily endorse every word said by my friend Mr. Bowen-Jones, and if I might be so rude, Sir George, I would express my regret that you have not felt yourself open to accept the resolution passed by this Congress, and have that submitted to the general meeting. That has been done in other sections, and I fail to see how we are to arrive at any practical

results from our deliberations to-day under the ruling you have given. The other sections have passed resolutions, and the resolutions will be submitted to the general body to-morrow for acceptance or rejection. If this section were to pass resolutions, that seems to me to be the only fair and proper manner in which our views can be laid before the great body. Of course we bow to the decision of our Chairman, but depend upon it it is open to this very great objection, that no matter what resolution may be come to, you gentlemen who are interested in this question have not had a proper means of ventilating it before it comes before the great body of the Congress. That is a position we ought not to occupy. We have all come here with one intention, namely, to do the very best we can to assist in the extermination, if possible, of this great and horrible disease. If any resolutions which may be submitted privately to the Chairman of this meeting are only going to be laid before certain other chairmen and other people who may meet in another room before they are submitted to the general body, depend upon it you are open to the very grievous objection—I will not put it by using the common words "hole and corner"—but there is the objection that it is not above-board. We want everything to be above-board, and we want to arrive at a practical result. We want that practical result to be something of the nature of what Mr. Bowen-Jones submitted. We want Parliament to alter the present condition of the law. How are we to obtain that? By boldly stating our case. People say we shall never get Parliament to agree. I beg their pardon; I have known Parliament to agree to many things to-morrow which they hated to-day, and I have known them, when you knock at the door very firmly, to open the door after a bit. We all know the history of the British Parliament: they are just what we make them, and depend upon it you can make them agree to what you set your face to, provided you only hammer away at them. Do not be discouraged. Do not sit down and say it is impossible that you will ever get Parliament, after this great war we have been engaged in, to agree to such a thing as this. The death-rate by the war is nothing when you look at it alongside the death-rate occasioned by this horrible disease. How can a Government that spends so many thousands and millions a year for the health of the country refuse when we convince them, as we are bound to do by such representations as we are about to make, that this is the way of all others to stop this horrible disease?

Mr. C. E. Pearson, of Sheffield, said: After the very able remarks which have fallen from our friend Mr. Cooper, who is about the best speaker the butcher trade has in London or out of it, it is rather a difficult task for me to say anything that will convey to your minds a better impression than Mr. Cooper has done. But at any rate, speaking for myself and the city I represent—Sheffield—I am heartily pleased with the recommendations which are being made by Mr. Bowen-Jones. Mr. Bowen-Jones, we know, has taken a very deep interest in this matter, or he would not have been prepared to lay these recommendations before us in the able manner he has done to-day. One of the recommendations that Mr. Bowen-Jones has given us is that compensation

should be paid for confiscation. That is one of the things that the butcher's trade and the federation have been standing up for through thick and thin. A great difficulty the butcher has had to contend with in the past, and is contending with to-day, is the very difficult position of going into the market, purchasing an animal in all good faith at the market price, and when he gets it home and slaughters it, finds it is subject to tuberculosis, either in a modified degree, or, it may be, with more generalised tuberculosis. He has that beast taken away from him, and it is not every butcher that can afford to lose one single beast. I speak with some experience, as I am in rather an extensive way of business in the city I come from, and I say that one beast taken from a butcher is a serious loss to him. But, as Mr. Cooper has said, it does not end there. There is the possibility of that man being taken before the Bench, and I have known cases myself where a fine has not been inflicted, but the man, through no fault of his own, has had to suffer the indignity of being sent to prison. I submit that this is a thing which ought not to be. We butchers are equally as loyal as any class of tradesmen. We pay our rates as freely as any other man; we contribute to the imperial taxation; why should we be condemned as guilty before we are allowed to prove ourselves innocent? That is law, but it is not justice. (Hear, hear.) There is just another little thing I should like to touch on, in connection with the very able paper read by Mr. King. I do not know Mr. King personally, but after listening with care and attention to his very able paper I have come to the conclusion that London is very highly favoured in having a veterinary inspector like him. (Cheers.) I only wish all the other towns were similarly favoured. Mr. King states—and I know that what he states in this particular instance is perfectly true—that now there is no inducement for the British agriculturist to feed cattle, for the simple reason that he knows it cannot pay. That is the case, more especially this year, when the price of store cattle has been so high that it is an impossibility for a British farmer to feed cattle to place on the English market meat at the prices he has to take for it. It is the outcome, undoubtedly, of the inspection the various medical officers of health and the inspectors have brought to bear. As I previously remarked, no man can afford to go into a market and buy an animal and have it taken away from him, and the consequence is he buys dead meat. That is putting a premium on the foreigner. I do not know whether it is to the advantage of this country that the foreigner should supply it altogether, but we must admit that when the agricultural interests of this country are good, a good trade generally follows. I do not want to make any personal allusions, but I am very pleased to tell you, gentlemen, and you Mr. Chairman more particularly, that the medical officer of health who yesterday read a very able paper on sanitation to the Congress, and the inspector we have now got for Sheffield, do act up to the Report of the Royal Commission, but all towns are not so circumstanced as Sheffield. What we want is a uniform inspection, that all men, medical officers and inspectors, shall exercise their discretion in the same manner in one city as they do in another. Yesterday one of the professors said that by placing *2d.* on sheep and *6d.* on beasts sold in the open market all the losses

in connection with tuberculosis would be covered. I beg leave to differ from that statement from more points than one. When a man goes into the open market what right has he to be saddled with the responsibility which the Government should take upon themselves? It would be the greatest injustice on the man who had to pay the *2d.* or *6d.* As it is intended for the public good, I maintain that the public ought to pay for it.

Mr. WILLIAM FIELD, M.P., said: There seems to be an impression amongst some members of this audience that some of us who happen to belong to a particular trade have come here altogether in the interests of that trade. I want to make my position quite clear. I am here as a delegate appointed by the Dublin branch of the National Association for the Prevention of Tuberculosis. I am here also as a delegate from the Victuallers' Association. But what brings me here chiefly is to learn what measures I conceive to be the most practicable and useful to put an end to this disease; and I am not here in the interests of any trade or profession or section of the community. (Cheers.) Now I hope I have made my position quite clear. Let me say, Mr. Chairman, that I have learned a good deal since I came to this Congress. I remember reading long ago that the belief of one age may become the heresy of the next, and we have seen so many differences of opinion amongst eminent medical men and eminent veterinary professors, that really the layman begins to get a bit confused. I remember when I was young that the doctrine of the doctors was, that all consumptive patients should be kept indoors, should not get much fresh air, should be clothed in blankets, and should be subjected to treatment that is now looked upon as a heresy. Am I right, Mr. Chairman?

The CHAIRMAN replied: Quite right.

Mr. WILLIAM FIELD, M.P., continuing: Very well. We had the other day the greatest eminent living scientist going clean against these theories that have been creating almost earthquakes in the trade, and telling the public that neither the consumption of meat nor the consumption of milk has any appreciable effect in the production of tuberculosis in the human being. I am not going to discuss that question, but I do say, as one of what is called the ignorant public, that I am bound to respect such an opinion as Professor Koch's, and am bound to say that I think the single opinion of that eminent scientist will do much more to clear the air in regard to certain cloudy theories that have been obscuring the vision of scientists and the public for years past than anything that has occurred for a long time. I am not going into the scientific merits of this question, but I will place before you just briefly a couple of hard facts, and I trust they will be reported. I have been studying the statistics of tuberculosis, and what do I find? Within the last twenty or twenty-five years I find that tuberculosis as a disease in human beings has decreased by 50 per cent. On the other hand, on studying the statistics, I find that the amount of meat eaten by the population compared

with the amount of meat eaten by the population in past times has more than doubled—in fact, trebled. If any man is going to follow me and contest what I say, I will ask him to explain the fact that tuberculosis has decreased by 50 per cent., while the consumption of meat has increased threefold. I want to know where the theory of the communicability of tuberculosis through the agency of meat comes in? How can it be demonstrated as a practical proposition in ordinary life? That is a problem of Euclid that I would like solved by some of the medical gentlemen present. Just one or two words with regard to the qualification of meat inspectors. Some years ago I moved in the House of Commons for a return of the meat inspectors, and we found then there were gardeners, plumbers, haymakers, everybody except somebody who knew anything about meat. (Laughter.) That is one of the peculiar ways British administrators have of doing business. That has been remedied to a certain extent, but we come to a much more important factor in the determination of this question, and that is uniformity of inspection. Although I am one of the wild Irishmen, I probably know as much about the cities of England as most men, and I know one city in England, which I think claims to be the second city of the Empire—but there are so many second cities in the empire now that we cannot mention them in a discussion (laughter), and it is almost as difficult a question to solve as the question of tuberculosis and the tuberculin test. But I know as a positive, absolute fact, that has come within my supervision—I am not mentioning the name of the city because I do not want to get into collision with any one connected with it—that the meat inspector says, "Yes, I will pass that meat if you do not send it to such and such a quarter." What does that mean? On one side of the city any kind of meat will be passed, and on the other side of the city hardly anything at all. Here is the chaos and confusion of British law. We had a Commission on Tuberculosis, of which our honourable Chairman was a worthy member, and indeed not the least important member, because he brought a great deal of common-sense and administrative ability to bear on the subject, but there was no representative of the trade on that Commission. A good many of the members were faddists who went in with the pre-conceived notion that if a man only touched a tuberculous beast on the skin, he would actually have tuberculosis within a quarter of an hour. (Laughter.) I am perfectly serious, it is so. In my opinion, every man is mad upon some one point. I just want to say something with regard to what I really got up to say, but somehow the preface is longer than the thing itself—I got up to support Mr. Bowen-Jones' resolution. (Hear, hear.) Why? Because I believe that is the practical way to get out of this difficulty. (Hear, hear.) I quite agree that the sturdy Saxon has an amount of common-sense that is not ordinarily distributed by Providence over the world, but how can you expect the average Britisher to give up his means of living in order that what he regards as a certain medical fad may be carried out? Mr. Bowen-Jones' proposition meets the difficulty. I have been a Member of Parliament a good many years, and I do not suppose I have done a great deal, but I know how difficult it is to get legislation passed; and until you educate public opinion

and focus it upon Parliament, proving that you have right and justice on your side, and that what you require is practicable, you will not get legislation passed. I am bound to say that if you brought forward a measure which can be proved to be in the interests of the community generally, the British House of Commons would pass it right off. Therefore I maintain that the resolution which has been brought forward by Mr. Bowen-Jones goes to the heart of the subject, touches the matter on tangible points which require to be met; and I believe if such a measure as that was brought into the House of Commons, there would not be much difficulty in passing it. The difficulty in regard to passing a measure of that kind in the House of Commons is first the Chancellor of the Exchequer. The British Treasury is a wall of brass against all improvements that require money. (Laughter.) What you have to prove to the Chancellor of the Exchequer is, that it is not going to cost so much, say, as the Transvaal war, and I believe we can show that the cost would be very reasonable, because if the recommendations of the Commission were generally adopted, the cost of carrying out this Act would be nothing like as great as some people suppose. If you had such an Act in operation the result would be general co-operation all round to carry out an Act of Parliament founded on justice and fair play. I must apologise for keeping you so long, but I am very much in earnest about this question. I have been President of the Meat Traders' Federation for four years, and this question has caused an enormous amount of friction, annoyance, and loss to the members of the trade. It should be the business of the Government to provide for the prosperity of every trade which is a tax-paying, fair, and honourable community. There is another point which is, to my mind, exceedingly important, and which is the reason why the agriculturists are so much with us. I wish to be perfectly frank. I do not see any reason for concealing my thoughts—I say what I think, and I think what I say. The agriculturists long ago would not have joined the meat trade, because they were at no loss, but now they find there is an undoubted depreciation in the value of native stock. Why? Because you cannot tell when some of these over-zealous inspectors and medical officers of health will co-operate to condemn animals. The great meat trade of this country is being thrown absolutely into the hands of the foreign trader. (Hear, hear.) That is a serious position which demands the attention of every man in the community. Your agriculture is bad enough, God knows! Everything comes from abroad. They get your money, and you get the stuff. The land of the three kingdoms is absolutely idle. It is only meat that makes the land pay; and if this resolution is carried, the agriculture of the kingdom will be improved. In my opinion, the resolutions proposed by Mr. Bowen-Jones will have the effect of insuring the co-operation of the community at large in carrying out a measure which will undoubtedly effect a great good in the direction we desire—viz., to put an end to this terrible disease of tuberculosis, and end its ravages amongst the people of the three kingdoms.

Mr. H. Coggan said: As the President of the National Federation of

Meat Traders I have felt it my duty to say a few words. I have no intention of labouring this question after the very able speeches of Mr. Cooper and Mr. Field, but I do want to set before the public, through the Press, the necessity of their aid in remedying the state of affairs. I endorse emphatically and cordially every word that fell from Mr. King, and I am glad to know we have in our midst such a man acting in such a fair spirit and setting such a noble example throughout the kingdom. But Mr. King did not deal with pigs, and my attention has been called this very morning to the seizure of no less than thirty pigs in the meat market at Smithfield, which were bought only last week at Ipswich at a price of £2 5*s.* per head. Seventy-three pigs were sent into the market and thirty were seized, and I want to ask through the Press if it is English justice that the man who bought those animals at the full market value should have them confiscated for the public good and lose out of his pocket something like £70 or £80? I regard the British public as a people who will have right and justice, and I am confident that if we are only supported by the Press as we ought to be supported we should soon have justice done us. Mr. Cooper said that all we have to do is to keep pegging away. I have been associated with the National Federation for a great many years and the Resolutions which Mr. Bowen-Jones has brought forward to-day are about word for word what we have asked. I wish to correct a mistake that the gentleman from Morpeth made with regard to Newcastle. Fortunately I am in the position to correct that statement, for as President of the National Federation I have received their balance-sheet and can give you the particulars. The 10*s.* 6*d.* per head the gentleman referred to has nothing whatever to do with the insurance fee at all. That is merely the members' subscription. As a matter of fact they have a system of insurance, for which they pay I believe a shilling per head for every ox and 2*s.* per head for every cow. At the end of the year so many cows had been confiscated that they had to make a fresh levy of 2*s.* 6*d.* per cow that had been killed in Newcastle. As a result, instead of 10*s.* 6*d.* per year it is often found to be 10*s.* per week. If a man killed four cows per week there was 10*s.*, or £26 a year. We have been long-suffering and we have shown our agricultural friends that one of two things must come to pass—we must either have compensation for what has been destroyed in the public interest, or we must go to the farmer and tell him that if we are to buy his cattle we must have a guarantee that they are sound. (Hear, hear.) As to the question of the inspection and medical officers of health, I regret to say I can endorse every word that has been said as to the way in which this matter has been carried out. Mr. Cope is quite familiar with a case, I think, in which one of the finest carcases that ever came into the city was seized, and through the opposition raised by the owner was actually released and a certificate given that it was fit for human food. I say that we ought to put into such positions of importance men who will not have to change their minds like the change of the wind. I look to the Press and to this section in particular to support all we meat traders consider our right and just demands.

A DELEGATE asked: Might I be allowed to ask if the pigs seized were dead or alive, and whether they were affected with swine fever?

Mr. COGGAN replied: The assumption was that they were affected with tuberculosis because there was an enlargement of the glands of the throat. They were killed yesterday and exposed in the meat market for sale to-day.

Mr. A. M. TROTTER, of Glasgow: The statement of Mr. Matthew Brechin is utterly untrue.

The CHAIRMAN: If you have anything to say about tuberculosis in relation to the meat supply I wlll hear it, but I cannot continue to listen to charges and contradictions.

Mr. TROTTER: That is a charge brought against my department.

The CHAIRMAN: I will not let it be discussed here.

Mr. TROTTER: I only wished to give it a public denial.

The CHAIRMAN: That is what you say.

Mr. ANDERSON, of Glasgow, said: I almost hesitate to offer a few remarks at this Congress, as I am not a butcher. The bulk of the gentlemen who have spoken have spoken of the cause of suffering under what I at once admit is a very serious hardship and injustice. But I am sent here as a delegate from the Corporation of Glasgow in the public interest simply, and there are one or two remarks which have been made which I think ought to be met, and I think some criticism upon these propositions ought also to be made. In the first place, I think such a wholesale order as this ought to have been put into the hands of the members so that we could grasp intelligently what we are asked to commit ourselves to, because the principle of compensation as here suggested is a very serious principle, and if at once admitted in connection with the meat trade will be taken as a precedent and applied to a great many other things. ("No, no.") Of course I expected the gentlemen here to say No, but if you have an Act of Parliament which enables you to construct a factory in a particular way in the year 1900, and in the year 1903 another Act of Parliament is introduced which completely revolutionises the Act of 1900, you expect the contractor to tear down his old place and make it in conformity with the Act. Take for instance your byres. You ask to have a particular floorage, or particular air space, and our medical officers are continually crying for more, so that the satisfactory byre of to-day is an unsatisfactory byre in the course of a year or two. You might say that that man was entitled to full compensation, but I object to the words "full compensation." Acts of Parliament are not meant to control the righteous, but to deal with the sinners, and the insertion of such words as

"full compensation" would at once create a new class who would seek to fatten on the Act of Parliament intended to protect honest tradesmen. ("Nothing of the kind.") I thought that would be said. I agree with the demand that there should be qualified inspectors, and I think the words "qualified veterinary inspection" ought to be put in. The circumstances to-day are altered. It is only two years since, on the advice and guidance of Dr. Koch, we instituted in Glasgow a complete meat inspection committee. We do not take to ourselves any of the remarks made here, because we have one chief veterinary surgeon on the staff, and three subordinate veterinary inspectors, with fourteen lay inspectors, all trained and qualified butchers. We take to ourselves the remark of the President of the Glasgow Butchers' Association, who said that in connection with meat inspection in Glasgow there was nothing to complain of. When a carcase is condemned it is put aside, and not even the trade is permitted to see that carcase unless by an order, which is at once granted, in order to provide rebutting evidence, if it is made by the person to whom the carcase belongs, but the veterinary officer declines to allow Tom, Dick, and Harry to go in and interfere with the carcase unless they have the authority of the person to whom the carcase belongs. The magistrate has been held up to ridicule. The magistrate has to deal with the evidence put before him, and being a country gentleman, is quite as likely to know something about tuberculosis as a sheriff who knows nothing about law, or one of our High Court judges. The position of affairs is very much altered by what has happened. When we were told that people were affected with tuberculosis by the consumption of milk, and to a less degree by the consumption of meat, we, at the expense of the rates, equipped a department in order to protect the public. I left Glasgow and came here, and I am now told, very much on the authority of the same scientist who promulgated the idea, that he questions whether bovine tuberculosis can now be communicated to man. If that is so, why should we be at all this trouble and expense of retaining highly expensive official departments? I say there is need for some particular standard. It is not fair that Mr. Field should be made to suffer by the illustration he has given that at certain ports carcases are allowed to pass if they are going to certain cities, and at certain cities in the kingdom a carcase can get in at the east end of the town and cannot be got in at the west end. These are things which are intolerable and which awaken the righteous indignation of the trade. But as a representative sent here first of all to protect the interests of the public, my opinion is that we should certainly protect the public with as little injury to the trade as possible. The resolutions which have been put before us, which ask us to give full compensation for the carcases, I certainly on behalf of my municipality must enter a caveat against. It has been very instructive to me to sit here and listen, but I do feel considerably handicapped. The City of Glasgow was asked to send so many representatives, and we have done so. But I find that our representation is wholely swamped by such cities as Dundee or Aberdeen. Being in Banff last Monday, I got the Aberdeenshire paper and found that the city of Aberdeen, not as representing the city, but as representing the

Butchers' Federation, were sending twelve representatives. If these twelve gentlemen are here you can easily understand that if it comes to the counting of heads those representing the public are not in it at all.

Mr. FAULKNER, of Banff, interposed, saying: I wish to deny that speech. I am one of the twelve, and I am a tenant farmer.

Mr. ANDERSON said: I simply say that in the Aberdeenshire Press I saw that statement.

Professor W. OWEN WILLIAMS, of Edinburgh, said: I rise to make a few remarks as a delegate sent by the National Veterinary Association. I can fully endorse what has been said by Mr. Bowen-Jones, and I agree with many of the things that Mr. Field has said, particularly with regard to the want of uniformity in inspection. I think you may take it from me that the veterinary profession is of opinion that meat inspection should be uniform, and that the only method of making it uniform is that the inspectors should be appointed by the Government. (Hear, hear.) Also that the powers of appointment should be taken from municipal authorities, and that it should be possible for the inspectors to be changed from one town to the other, so that there may be no probability of any local influence upon them in carrying out their duties. Not that I wish to cast any reflection on the honour of any man, but it is as well that a man should not be placed in a position where he might be tempted and fall. Until we have public slaughter-houses, it will be quite impossible to have thorough inspection, and I strongly advocate public slaughter-houses and inspectors to inspect them. It is quite impossible to stamp out tuberculosis if private slaughter-houses are permitted to exist in various parts of the country. I have no desire to say anything about compensation except in an indirect way. If compensation is about to be given, it should not be made permanent. I should give a certain amount of compensation, if it is to be given, for three years, and then diminished compensation for two years, and then abolish it and make it a punishable offence to have the disease. If that is done it will encourage people to at once report cases of tuberculosis. ("No, no.") They would very soon get rid of the disease by doing that.

Mr. RAMSDEN asked: Does Professor Williams know a city in the United Kingdom where an inspector cannot get admission to a private slaughter-house?

The CHAIRMAN answered: I do not think we can go into the question of private or public slaughter-houses. It would lead to a very awkward discussion.

The Hon. W. P. REEVES, the Agent-General for New Zealand, said: I have no pretence to scientific knowledge, and should not have risen to

address you had it not been for some remarks by a previous speaker on the question of tuberculosis in animals which are confined as compared with the absence of tuberculosis in animals which are kept in the open air. I am prepared to admit, from what one has read, that no doubt you see much more tuberculosis in animals that are kept under cover, but in the colonies of Queensland and New Zealand there are hardly any animals kept under cover. In Queensland there are five million cattle in the open air and in New Zealand one and a half million in the open air, yet I am sorry to say tuberculosis is found in both the colonies, requiring the very closest inspection by the Government and its veterinary inspectors. After long experience and very close examination and discussion by the Government and its officers, we have passed a law in New Zealand that every town having 2000 inhabitants shall erect public abattoirs, that all the slaughtering of meat shall be done there, and that that slaughtering shall be subject to Government inspection. The veterinary inspectors are appointed by the Central Department of Agriculture, and are the paid officers of the Central Government. That is our system as regards beasts that are slaughtered. When they are the property of farmers we pay the farmers half the value of the slaughtered beast. The Government takes the carcase, and it is reduced to manure. It is not buried or allowed to be given to pigs, as was the case in the pre-scientific days in the colonies, but it is reduced to manure. The hoofs and hides become the property of the Government, and are sold for what they will fetch. It is a common thing now, and is growing more common every year, for a farmer who suspects the presence of tuberculosis in his herd to ask the Government inspectors to come and inspect them. In that way we consider we are getting the better of tuberculosis, and we hope to see it in the course of a reasonable number of years pretty well stamped out.

Mr. WILLIAM HUNTING said: The theory of meat inspection, as I understand it, is to protect the public. The practice of meat inspection is to inspect less than half the meat consumed in the country and to inspect the other half by men, as a rule, who know nothing about it. The result, of course, is the grossest injustice to the meat seller. As far as I can see, the only way to protect the public against tuberculous meat is to make meat regulations part and parcel of a larger and more uniform scheme under the Board of Agriculture for the stamping out of the disease at its source. (Hear, hear.) We may go on meat inspecting apparently absolutely indefinitely, because there is no control whatever upon the breeder or feeder, nothing whatever to induce him to keep his herds healthy. So long as he can sell his bullocks and his cows to the butcher he has done with them, and he has no further interest in the matter. But it also strikes me that, unless you join in a demand for general measures for the disease, it is a little illogical to ask for compensation for a butcher as the law stands, because, as the farmer now has no interest, so the butcher, if he got full compensation, would have no interest in looking after the disease. If we are to have a logical set of measures against tuberculosis, we must provide not only for the disease when it is in the

hands of the butcher and the cowkeeper, but when it is in the hands of the farmer. I have only one other word to say. One speaker suggested that we should try and move Parliament. Well, it is a difficult job, and you can only do it in front of a general election, when the members will promise anything you like. A great deal of good might be done by the Government department which looks after cattle, the Board of Agriculture, and that which looks after human beings, the Local Government Board. But if it is difficult to move Parliament, it is an absolute impossibility to move a Government department. (Laughter and cheers.)

Mr. JAMES KING, in reply, said: My object in writing the Paper was to provoke discussion, and I think I have done so. I do not think I can add anything to what has been said, as I agree with most of the speakers. One remark was made as to inspectors not allowing the owners of confiscated carcases to see them. I think if permission to inspect had been requested in the proper way no inspector would have refused it. It is to the interest of the inspector, and to the interest of the owner, to have all the evidence that is possible with regard to the carcase. It is not to the interest of either the inspector or the owner to allow Tom, Dick, and Harry, as was said, to go and inspect it. It is very often the case that the owner is the last man to see the carcase. Veterinary inspectors and other inspectors are official servants of the Corporations, and they have reputations to look after. I know it is usual for an inspector, when any one wishes to see a carcase, to grant an order, and it is also usual for him to be present when the owner and the expert see the carcase. Every inspector I am acquainted with will allow an owner or an expert to take away any parts of it, provided he leaves one part.

On the motion of Mr. FIELD, M.P., a hearty vote of thanks was accorded to the Chairman, and the Section adjourned.

THE last Meeting of this Section was held on Friday, July 26, 1901, Sir GEORGE BROWN, C.B., being in the Chair. The Subject of—

LEGISLATION SUGGESTED FOR CONTROLLING AND ERADICATING TUBERCULOSIS IN ANIMALS

was introduced by Professor DUNCAN MCEACHRAN, F.R.C.V.S., D.V.M., of Montreal, as follows:—

The subject for discussion which I have the privilege of introducing to-day is one of very serious import, and one which requires to be very carefully considered in all its various bearings—lest by proposing impractical enactments we nullify our good intentions, and give rise (as has already been done in some countries and States) to bitter opposition by the owners of infected herds.

Our efforts must be to educate the people so that they themselves will voluntarily adopt our suggestions, and, with the assistance of the State, bring about a gradual diminution in the numbers of tuberculous animals in our herds, and the adoption by every stock owner in the land of thorough preventive measures by which re-introduction of the disease will be rendered impossible.

The first step therefore which I would recommend is the publication and distribution among the masses—the agricultural population in particular—of information on the subject of tuberculosis. Much good work has already been done in this direction, but more must be done. If we look back for thirty-five years, when Villimin, Viseur, Chauveau, Gerlach, and others were engaged in demonstrating the contagious character and transmissibility of this disease, and compare our scanty knowledge then with the vast amount of information which, thanks to Koch, Bang, Nocard, and many others, we now possess, it will be easily understood why we who have been in the field of active work in the practical sense, as practitioners and advisers of our governments, have in early days hesitated to advise active control or eradication measures, and why the governments have been slow to pass enactments bearing on the subject.

It was in 1882 that Koch first communicated the results of his investigations of the etiology of tuberculosis before the Physiological Society of Berlin, followed by further communications later. The knowledge of its transmissibility being due to a specific bacillus led to much investigation and experimentation. The reports and contributions to the literature of Tuberculosis have for many years filled our journals and bookshelves to such an extent that no excuse is left for ignorance concerning the subject on the part of those interested in it.

In citing evidence in support of any suggestions one may make as to legislation necessary to enable the people, assisted by the Government, to control and subsequently eradicate tuberculosis from the lower animals, we necessarily must consider the measures tried by those countries, especially in Europe and America, which have dealt with it. It is to be hoped that in the

course of the discussion some new practical suggestions will be adduced which this Congress can recommend for adoption.

Until Koch demonstrated that tuberculosis was due to the invasion of an organism, the tubercle bacillus, communicated either directly from an infected person or animal or by intermediate sources of infection, especially by buildings, pathologists were content to attribute its existence and extension to heredity. When however its real nature and its pronounced contagious character came to be known, both medical and veterinary practitioners stood aghast in contemplation of the thousand and one blunders which crowded their memories consequent on want of this knowledge.

I remember well when, thirty years ago, I had temerity enough to read a paper, based on the Continental investigations above referred to, before the Medico-Chirurgical Society of Montreal, in which I ventured to say :—"The experiments of Continental investigators have clearly established the close relationship between tuberculosis in men and in animals, and the possibility of the disease being in many ways transmitted from the one to the other; and I am well aware that this disease is far more prevalent in the dairy herds supplying milk to the citizens of Montreal than is generally known, therefore I feel it my duty to invoke the aid of this society in endeavouring to bring about certain sanitary improvements in connection with our meat and milk supply by the establishment of abattoirs under proper inspection: supervision of dairies and inspection of milk." Such was the limited information on these matters at that date that of about forty members present only one was in sympathy with the statements made. He was at the time a young man but recently graduated, who has since made his mark in the world of medical science—I refer to Professor Wm. Osler, of John Hopkins' Hospital, Baltimore. He alone would admit even the probability of contagion, or intercommunicability from animals to mankind, or from mankind to animals—a doctrine which was to sweep away their long-cherished belief in heredity as its sole cause.

Pursuing this subject by close observation and numerous investigations of herds in Canada, in which this disease existed, instance after instance came to my knowledge of cases where the infecting animal was clearly traced to a diseased herd.

Valuable herds were destroyed by its introduction, and several owners brought to the verge of ruin. At the period to which I refer Shorthorn cattle (Bates and Booth families) had attained fabulous values, £5,000 being a common price for a Duchess heifer, one cow being sold for nearly £9,000 in the State of New York. Many of them were tuberculous.

The frequent discovery by clinical examination of cattle imported from Britain passing through our quarantines, tuberculosis not being legally classified as a contagious disease at that time, obliged me to urge on the Government the necessity of amending the Animals Contagious Diseases Act so as to include tuberculosis in the list of contagious diseases. This was done in 1886, thus enabling us to put a stop to such dangerous animals being admitted to the country to the serious detriment of our home herds.

Members of my own, and of the medical profession, did not hesitate to say that this act was premature owing to the etiology of the disease being not then sufficiently understood.

Were proofs wanting of its contagiousness, I could furnish sufficient to convince the most sceptical, but I would be wasting your time by their recital. I must, however, crave your indulgence for a few minutes while I make some general allusions to this characteristic of the disease.

The infection of healthy animals we know takes place readily from cohabitation, the bacilli gaining entrance by the respiratory organs in most cases but by the digestive tract in many, especially in calves when suckled by diseased mothers, and calves, pigs and other animals fed on milk, or on dairy bye-products containing living bacilli. In pigs when allowed to eat tuberculous matter found in carcases and slaughter-house refuse given them as food; probably, too, in rare instances, from eating the flesh of tuberculous animals. It is to the buildings themselves, however, we must look for the chief source of infection, and to neglect of disinfection and sanitation must we attribute in a great measure the continuance of the disease and reinfections with which we are familiar. I could cite repeated instances of herds cleared out and new purchases made, with every care in purchasing, being followed by new cases of tuberculosis; so that I feel that too much trouble cannot be taken by practitioners who are employed to eradicate this disease, to make sure that the buildings are aseptic and that sufficient air-space is provided as well as a rational system of ventilation, whereby pure air is admitted and foul air driven out, also that properly trapped drains carry off the liquid excrements and prevent the return of noxious vapours.

The importance of pure air and sunshine cannot be overstated in considering the prevention of tuberculosis. It is, however, a mistake to suppose that infection will not take place when diseased and healthy cattle are brought together, even when these conditions exist in the very highest degree.

I have seen tuberculosis prevalent in ranche cattle, few of which were ever under a roof, ranging on the foothills of the Rocky Mountains in Montana. I have known a valuable herd of Polled Angus which was brought into the Peace River country in the far North-West of Canada, which proved to be tuberculous, and was ultimately exterminated in consequence. In these and other instances which might be referred to, pure air and sunshine certainly prevailed, yet it did not prevent infection taking place when they were congregated in corrals, bunched together during fly-time, or in infected sheds in winter.

Heredity.

To eliminate heredity entirely from the causative faculty would be an error; but we are safe in saying that it plays a very unimportant part in its extension. The rarity of the disease being found in calves at birth in all countries has been noticed by Professors Bang, Siedamgrotzky and others,

and the immense success attending the rearing of calves from tuberculous cows by Bang's system in Denmark and other countries, including Canada, proves conclusively that it is not hereditary in the same sense as gout or insanity are known to be transmitted from parent to progeny.

When visiting Professor Bang at Copenhagen, three years ago, he showed me two newly-born calves sent in by an inspector; in the livers of both tubercules were found.

Uterine tuberculosis when seen is generally associated with generalised miliary tuberculosis, especially when it is peritoneal.

The rarity of tuberculosis in the male genital organs precludes the probability of infection by copulation, except in very rare instances; hence, we infer that when the newly-born calf is found tuberculous, infection has probably taken place within a diseased uterus.

By far the most numerous infections have occurred after birth. Bang says:—"I had occasion to observe more than 400 cases of tuberculosis either in fœtuses or newly-born calves; nevertheless, the number of congenital tuberculosis has scarcely gone beyond 0·33 per cent. of the killed calves even in the most infected regions."

While intra-uterine infection from a diseased mother is occasionally seen, congenital tuberculosis plays a very unimportant part in the continuance and extension of the disease, compared with the many ways in which the essential factor in its production, viz., the tubercle bacillus, gains an entrance to the animal body—in other words, tuberculosis is a contagious disease, not an hereditary one as was supposed.

The Diagnosis of Tuberculosis.

The clinical diagnosis of tuberculosis even by the most expert clinical examiner, except in advanced cases, is always unreliable, as tubercle may exist in such a stage as would be impossible of diagnosis by this means.

The Tuberculin Test.

The discovery by Koch, in 1890, of the production of fever, indicated by a rise in temperature, in tuberculous animals into which he injected a sterilised glycerine extract of pure cultures of tubercle bacilli, while it produced no effect whatever when the animals were free from that disease, furnished us with a simple but very reliable diagnostic agent.

The effect produced by this discovery on the commercial aspect of the business of the dairyman and cattle-breeder have been in many instances most disastrous. Herds which were supposed to be free from disease were discovered by this test to be tuberculous, dairy businesses have been ruined, justly so we must admit, for no man has a right to sell milk, or dairy products manufactured from them, when derived from diseased cows any more than a breeder of pure-bred stock has to sell animals suffering from a contagious disease from which recovery is the exception.

This exposure by this means of the prevalence of the disease, especially in dairy cattle, naturally aroused anxiety in the minds of the guardians of public health; a furor was thus created, and the public mind greatly disturbed when, in addition to this, its intercommunicability to human beings was made known.

Hence we find many dairymen and cattle-men in all countries denouncing tuberculin, and protesting against its use; not all dairymen, nor all breeders, however, joined in the denunciation of what is well known to be a safe, harmless, but reliable means of detecting this disease, even in its most incipient stages.

In Canada during the past year, from 1st November to 1st November, there were 17,785 head of dairy cattle tested officially by voluntary application of the owners, on condition that the entire herd be tested and all reacting animals quarantined for life, without compensation. Of this number only 358 reacted, or about two per cent.

What opposition we met with came from breeders who had suspicious herds, or herds which, by private testing, were known to be diseased; it came chiefly from men who combined importing for speculative purposes with breeding.

In some of these cases the importers, we have reason to believe, were not ignorant of the cattle being tuberculous; in others we fear the man who paid the money was a victim of imposition or gross neglect of his interests on the part of his agent.

I will cite one instance of each case which came under my personal notice.

(*a*) A herd of thirteen cattle arrived at Point Levis quarantine—two of them showing clinical symptoms of the disease—examination of the chart which accompanied them showed that it was not genuine. It was therefore decided to test them, to which the person who had imported them objected, and while correspondence was going on one cow died from acute generalised tuberculosis; of the rest all reacted but one, and on post-mortem examination all were found tuberculous.

(*b*) A gentleman of large means decided to import a herd of useful but not high-priced shorthorns. He sent an agent to purchase and import them. This agent was instructed to use every precaution by testing, and otherwise to secure animals free from tuberculosis. They were bought in Ireland without testing them; they were brought to Scotland, there tested; two were rejected, the balance shipped to Canada with a chart which was not quite satisfactory, and on testing them, by request of the owner, five out of thirteen reacted.

Personally, I believe with Professor Nocard that tuberculin does not lie; how is it then that so many tuberculous cattle come to us in America accompanied by charts and certificates of health?

If the importer is a party to fraud, then he should be severely dealt with; if negligent, then he should pay the penalty of his negligence, for he has no right to import animals suffering from a contagious disease.

Is it possible that agents or middlemen deal in suspected cattle—which are bought knowingly by the one class of importer, or foisted on to the other? Is the professional man, employed to test for export, imposed on by previous

tuberculination nullifying or at least rendering uncertain his honestly applied test? Are all such men above suspicion? My own experience in a few instances in Canada compels me to say no, nor is it the tuberculin that is at fault.

When we meet with reactions varying from forty to ninety per cent. in cattle certified as healthy, as is found in both Canadian and United States importations, such questions force themselves on us, and are sufficient explanation of why both Governments have each decided to keep a professional man in Britain, on whose charts alone will cattle be allowed to pass through our quarantines without retesting.

Reaction.

We are often asked by importers and testers in Britain what reaction we consider indicates tuberculosis. Experience has taught us that it is not the extent of the rise in temperature so much as its character taken in conjunction with attendant circumstances. Ordinarily a rise of 2° F. above the highest normal is due to tubercle being present; but the single occurrence during the day of such a rise may be due to some accidental circumstance. A typical reaction is arched, the maximum temperature occurring the seventeenth hour, falling to normal about the twenty-fourth hour, or sooner in many cases. The character of the reaction may be altered by copious draughts of cold water, or a lowering of the body temperature from any cause; so also does the raising of the body heat from such causes as flies, atmospheric heat and scarcity of water, all of which produce variations in the reactions. In addition to which might be mentioned applying the test when the animal is excited from any cause, such as driving cows from the field to the stable, railroad journeys, steamboat conveyance, change of climate, change of byre, bulling, stage of the disease (in advanced cases often no reaction follows), and, what to us is most important, the uncertainty of reaction for months after injection of tuberculin.

As I said above, tuberculin can be almost absolutely relied upon if properly used. There is no other diagnostic agent to be compared with it, yet it is capable of much abuse, and is often improperly used.

Objections Urged Against the Tuberculin Test.

In my opinion there is not one argument used by cattle owners or importers against its use tenable. I have never known a single instance of a person owning a healthy herd lifting his voice against it, but I could multiply instances of men becoming almost maniacal in their denunciation of the test since it has been required in the international live-stock trade between the United States and Canada, as well as importations from Europe; men whose herds, when tested, reacted sufficiently to warrant one in suspecting previous knowledge from private testing on their part.

With a view to get at the truth of some of their objections, I sent a circular-

letter to inspectors throughout Canada, in which I asked replies to the following questions, suggested by newspaper discussions on the subject :—

1. "Do you know of any cases in which the use of tuberculin as a test has produced abortion?"

2. "Do you know of any instance in which a bull has been rendered impotent by the use of tuberculin?"

3. "Do you know of any case in which the general health of the animals has been injured by the tuberculin test?"

4. "How many cattle have you tested during the past year?"

5. "How many post-mortem examinations have you witnessed of animals condemned in consequence of having reacted to the test?"

6. "In how many instances did you fail to find tubercle?"

The replies are all negative to the first three questions; to the fourth they aggregate 22,023 head; to the fifth 579; and to the sixth ten, and one doubtful.

Professor Leonard Pearson, State Veterinarian for Pennsylvania, states, in his report for 1899, that "of 4,400 post-mortem examinations made, tuberculosis was found in all but eight animals that had reacted."

I also sent similar questions to a few of the farmers who had most experience with it. The following replies will represent the others :—

(*a*) In answer to the first question—"Do you think that the test injures cattle in any way?"—he says, "No; I do not think there is the least injury in the tuberculin test. Our herd of over fifty head has been tested three years in succession, and I fail to notice any injurous effects whatever from the test."

In answer to question number two—"Have you ever had any bad results that you could attribute to the use of tuberculin?"—he says, "None. I am using a bull that has been tested five years in succession, and is seven years old, and a more active healthy animal I never saw—a very sure animal, you may judge, by our dairy of forty-two cows—there is only one farrow. As to abortion, we do not have near the trouble that we had before we commenced testing, for I consider that we have a healthy herd now. Previous to the testing of our dairy we had very serious trouble with abortion."

(*b*) 1. "I do not know of any case wherein the use of tuberculin has produced abortion, and on our farms we have tested cows at all stages, up to within a very short time of calving.

2. "I have never known of a case wherein a bull was rendered impotent or injured in any degree whatever by the use of the tuberculin test.

3. "I have not known of a single case wherein the application of the tuberculin test affected prejudicially in the slightest degree the general health of animals tested therewith.

4. "We have had between three and four hundred cattle tested.

5. "I have not personally witnessed any post-mortem examinations, but I have had reports from the veterinary surgeon who does our work on every animal which was condemned as a result of the test, and in almost every one positive traces of the disease were found."

From these facts we deduce the following:—

(*a*) Tuberculosis is essentially a contagious disease, and ought to be so classified and acknowledged by every country and state in the world as such.

(*b*) It is insidious in its character, and in only a few cases comparatively can it be diagnosed by physical examination; but in tuberculin we have a safe and reliable test by which even latent cases can be diagnosed.

(*c*) That tuberculin is harmless. It does not produce abortion in pregnant cows, impotency in bulls, or in any way produce any injurous effects on animals tested by it.

Methods Adopted by Different Countries.

Some years ago, in Massachusetts, compulsory testing was tried, but was found to be impracticable, and met with strong opposition.

Belgium adopted somewhat similar methods with similar results. It had to be given up, and at present the killing is restricted to animals in which the diagnosis can be made by clinical examination.

In Switzerland free testing is practised. All clinically diseased are slaughtered; reacting animals are marked by cutting out a triangular portion of the ear.

In France, immediate slaughter of clinically diseased animals, and slaughter within one year of reacting ones.

In Germany tuberculin is furnished free, and monetary aid is given to those who adopt the Danish system, and otherwise resort to prophylactic measures for its eradication. In most of the German States it is required to sterilise the creamery and dairy products and their by-products, skim and butter milk.

In Denmark free testing is done on voluntary application. Clinically diseased are killed; the others are divided into healthy and reacting. These are separated in different buildings, or partitions are used to divide the byres; in one section the healthy, in the other the diseased, are placed. The reacting ones are bred from; the calves are reared on milk from healthy cows or pasteurised milk, or milk which has been heated sufficiently to kill the tubercle bacilli. The success of this plan has been fully demonstrated by Professor Bang.

In America—both the United States and Canada—for a number of years, all cattle imported from Europe were tested in the quarantines. A few years ago importers urged that the practice too often led them into serious losses—the value of the diseased animals as well as freight and other expenses incurred—and discouraged, as a consequence, importation generally; and to meet the views of importers the Canadian Minister of Agriculture ordered that a number of veterinarians throughout Britain be selected, whose charts of test would be accepted without testing again in Canadian quarantines. This plan worked very badly, as numbers of diseased cattle were imported, several valuable herds being found clinically diseased, and were slaughtered.

The United States had similar experiences with British charts of testing. This is regrettable, as both countries acknowledge the great results obtained by British breeders in producing excellent cattle, knowing as they do that on no spot on earth can cattle of equal merit be produced. There is something in the soil and the air of the sea-girt isle so favourable to the production of high-class bovines that breeders abroad must come to Britain for fresh blood to keep up their herds, otherwise marked degeneration is soon apparent. For this reason each country, rather than prohibit importation altogether, has appointed a veterinarian to do the testing, and on their charts alone cattle are admitted to both countries without being tested in quarantine.

In Canada testing is done at Government expense, when voluntary application is made for testing the whole herd, and reacting animals are quarantined for life. Bang's system is coming much into practice in Canada. In a few herds it has been successful in a remarkable degree. No compulsory measures have been tried. Tuberculosis exists in Canada to a limited extent only. No statistics for the entire Dominion are available, but the following figures indicate this. Testing has so far been confined almost entirely to dairy herds, and was employed in the most of these owing to suspicion or knowledge of infection.

Year.	Tested.	Reacted.
1897–98	6,516	412
1898–99	16,882	451
1899–1900	17,785	358

The following regulations are enforced between the United States and Canada :—

Breeding Stock.

Sec. 21. All cattle to be admitted for breeding purposes shall be accompanied by :—

(*a*) A declaration made by the importer that they are actually for breeding and no other purposes.

(*b*) A certificate signed by a Government veterinarian specially selected and appointed for this duty that they have been subjected to the tuberculin test and found free from tuberculosis. Such certificates must show the date of testing and chart of reaction, with a description of the animal, giving age and markings. The importer may be required to swear that the certificate refers to the animal represented.

(*c*) A certificate of inspection signed by a Government veterinarian showing that the animals are free from contagious disease, and that no contagious disease of cattle (excepting tuberculosis and actinomycosis) exists in the district whence they came.

(*d*) When not accompanied by such certificates, the animal or animals must be detained in quarantine one week and subjected to the tuberculin test.

(*e*) Should they be found tuberculous they must be returned to the country from which shipped, or slaughtered without compensation.

Fat Cattle and Cattle for Feeding, including Range Cattle for Stocking Ranches.

Sec. 22. This class of animals shall be accompanied by a certificate of inspection signed by an official veterinarian showing that the animals are free from contagious disease, and that no contagious disease of cattle (excepting tuberculosis and actinomycosis) exists in the district whence they came.

Settlers' Cattle.

Sec. 23. Settlers' cattle when accompanied by certificates of health to be admitted without detention; when not so accompanied they must be inspected. Inspectors may subject any cattle showing symptoms of tuberculosis to the tuberculin test before allowing them to enter.

Sec. 24. Any cattle found tuberculous to be returned to the United States, or killed without indemnity.

The following extracts from copies of the laws and regulations governing the control and for the eradication of tuberculosis in individual States, furnished me by the authorities, may be cited with advantage, and can be found more in detail in a bulletin recently issued by Dr. Salmon, Chief of the Bureau of Animal Industry, at Washington:—

State Legislation with Reference to Bovine Tuberculosis.

Illinois.—Legislation under Board of Live Stock Commissioners. Their rules and regulations are as follows:—

All cases reported to Board. When physical condition indicated tuberculosis all exposures are quarantined till tested under direction of the Board. Rise of 2 degrees or more (if in opinion of veterinarian in charge is due to tuberculin) constitutes reaction, and such animals must be isolated and held in quarantine till slaughtered and examined post-mortem. Rise of 1·5 and less than 2 degrees are suspicious, must be isolated and quarantined for retest. Maximum indemnity not to exceed $75.

Classification for Compensation.

Class A.—No lesions. Full appraisal.
„ B.—Incipient disease. 75% of appraised value.
„ C.—Infected for one year. 50% of appraised value.
„ D.—Infected for two years. 35% of appraised value.
„ E.—Infected for three years. 25% of appraised value.
„ F.—Infected more than three years. 15% of appraised value.

Should proceeds of carcase exceed percentage valuation, owner receives full amount.

"Definite legislation needed, with money to carry out provisions. Time not ripe for drastic measures."

Iowa.—No special legislation. Tuberculin used where necessity and public safety demands. Reacting animals tagged and quarantined, provision being made that they may be shipped to any abattoir in the State for slaughter,

subject to inspection by Bureau Inspector, State Veterinarian, or one of his assistants. No remuneration save what animal will bring as fertiliser. 30% of the reacting animals are condemned on post-mortem.

Work that is done, is done thoroughly, but more is needed.

Kansas.—No specific law. Must be tested on entering the State. May be brought in for show purposes without test, but if sold must be tested before allowed to stay in State. At the present time there is litigation as to legality of rules and regulations.

Kentucky.—No special legislation. May be dealt with by State Board of Health. Animal cannot be condemned until examined by competent veterinarian. Indemnity is not provided.

Maine.—Commission of three persons appointed by Governor. Necessary quarantine enforced; half compensation for animals destroyed, providing they have been in the State a year or more. Compensation not to exceed $100 for pedigreed, or $50 for grade stock. Appraisal not being accepted by owner, rigid quarantine enforced.

Tuberculin test not officially designated.

Regulations sufficient, but not enough funds for enforcing properly.

Massachusetts.—General laws on contagious diseases cover tuberculosis. Compensation to full value not to exceed $40·00 in any case. Tuberculin restricted to cattle brought in from without the State, excepting upon written request of the owner, and on such animals as are condemned as being tuberculous by a competent veterinary surgeon. No compensation granted unless rules regarding disinfection, cleanliness, ventilation, light and water supply are complied with as directed by the Commission. Owners using tuberculin are not entitled to indemnity for animals which react, unless the testing is done by its Board of Cattle Commissioners, or by its direction.

Regulations work well and good work done, but more money could be spent to advantage.

Michigan.—General law on contagious diseases; no special on tuberculosis. State Veterinarian is acting under general law against tuberculosis. On complaint of Local Board of Health or individuals, suspected cases of tuberculosis are tested. Reacting animals are destroyed or rigidly quarantined. No provision against entrance of tuberculous cattle. Governor has power to prevent, but Commissioner has not seen fit to protect the State.

Minnesota.—General legislation applies empowering Local or State Board of Health to act. Two tuberculin tests are required to condemn a tuberculous animal, and must be given within three months and in not less than two months. No further legislation. Experience shows inefficiency of procedure now in vogue.

Montana.—Towns of 5,000 or over to have meat and milk inspector, who must be a graduate of reputable Veterinary Medical College. All animals supplying milk to the public must have a certificate of tuberculin test, and are inspected every month. Laws just passed, and it is thought that they will prove sufficient if carried out to the letter. Not much tuberculosis in the State—only about 5%.

New Hampshire.—General law relates to tuberculosis. Co-operation is general with Federal Bureau. Indemnity, full appraised value, to be paid by towns, which are reimbursed four-fifths by the State. Such animals must have been owned within the State three months before detection of disease. Cattle entering the State must be tested under authority of Board of Commissioners. Pasturage permits granted on physical examination by competent veterinarian—a graduate of a recognised school. Massachusetts cattle, tagged by the Mass. Cattle Commission, allowed to go to New Hampshire for pasturing and return to Massachusetts without test.

Upon request by cattle-owner he may have his herd officially inspected by the Board. If inspector deems it necessary tuberculin is used, and owner must conform to measures prescribed by Board. Test applied at State's expense, and half value for all animals reacting. Precautionary measures to stamp out disease at owner's expense.

Experience shows that enforcement of sanitary measures is as important as the destruction of diseased animals. Ventilation, light, exercise of animals, and disinfection regarded as the most important part of the work. Progress is being made in suppression. Radical measures not needed.

New Jersey.—Commission of seven, composed of President and Secretary of Board of Agriculture and five others appointed by the President, examine herds on request, but tuberculin test is optional with the Commission. Condemned animals appraised at market value, and three-fourths paid to owner. All cattle from without the State are tested.

Gradually lessening prevalence by educating farmers as to its character and the need of greater care in breeding, stabling, sunlight, and ventilation.

State of New York.—Tuberculin applied upon written request under conditions prescribed by Commissioner of Agriculture. Commissioner may order test, holding a reacting animal in strict quarantine. He may condemn, quarantine, or slaughter when tuberculosis is found on physical examination. Compensation shall not exceed $60·00 for thoroughbred, and $40·00 for grade, providing animal is not found to be diseased at the post-mortem. If the animal is diseased with disease for which it was killed, or other dangerously contagious or infectious disease, no compensation is allowed.

Animals entering the State passing the Federal authorities are allowed to proceed.

North Dakota.—Tuberculosis under general legislation. State and district veterinarians can deal with subject. Cattle from without the State must have certificate of health or be examined by State official. Tuberculin test not specified.

Pennsylvania.—All animals entering the State must be tested with tuberculin. Other testing left to discretion of Board. Compensation not more than $25·00 for infected grade, and $50·00 for infected registered stock. Measures for combating this disease, as well as others, at discretion of Board, and are not flexible.

Rhode Island.—Appraisal for "scrub" animal $50·00, grade $75·00, and registered $100·00. In event of animal being found infected at autopsy, State

pays half value, but if healthy full value. Animal must be owned within the State at least three months previous. Cattle coming into the State must be tested with tuberculin.

Utah.—Cattle having tuberculosis shall not be kept by dairymen, and shall be killed by the Dairy and Food Commissioners. There is no provision for the tuberculin test or for indemnity.

Vermont.—Tuberculin test without expense on application and whole herd must be tested. Such herds cannot admit new animals unless they undergo the test. Reacting animals must be killed and buried or burned at the expense of the owners. Owners retain the hides. Board regulates right to retest when considered necessary. Rules of Board, where herds are tested regarding disinfection, must be observed. Cattle entering the State from without must be tested by person approved by Board and expense borne by owner. Animals killed by written order of the Board, appraised, such appraisal not to exceed $40·00. Post-mortem held, and if tuberculosis or other disease dangerous to public health is found, owner receives half appraised value. Such animal shall have been in the State six months previous to discovery of disease.

Experience shows that if rules are followed for disinfection, disease is stamped out. Persuasion used by Board to induce testing of suspected herd. Measures radical enough at present, for the public must be considered and be in sympathy with the movement rather than antagonistic.

Virginia.—Tuberculosis is classed as a highly contagious and infectious disease. Board of Control of Agricultural College has power to enforce such measures for its control as are deemed necessary.

Educate the People.

Educate the people by furnishing them with the most important scientific and practical facts known about the disease. Much good has been done in Canada by the distribution broadcast of bulletins, from which the following items are extracted :—

Tuberculosis.

This disease claims for its victims nearly, perhaps we might say all the domestic animals, and few of the wild animals subjected to domestication resist the contagion, as is well known to keepers of menageries. Rats, mice, and other vermin which inhabit houses and outbuildings not only contract the disease, but are active agents in spreading it.

Some species are more susceptible than others, and contract it readily by eating food containing the germ of the disease, or inhaling the dried germs given off from the lungs, throat, uterus, or intestines of animals affected in these organs.

The most susceptible of the domestic animals are cattle, swine, chickens, goats and rabbits. These contract it readily in the natural way, but it can be produced in sheep, dogs, cats and horses by inoculation with tuberculous material.

Tuberculosis in the lower animals is the analogue of consumption in the human family. It is due to a similar germ (*Bacillus tuberculosis bovis*), but it is, however, more virulent than the human bacillus.

It is communicable from other animals to man, and from man to the lower animals, by natural infection and inoculation.

Tuberculous Nodules.

The germs (bacilli), which are living organisms of minute microscopic size, when they reach and become located in a tissue, produce local irritation and the formation of small reddened areas infiltrated with fluid and cells. These are the tubercles. As they become older they enlarge, and their colour is greyish or yellow from changes that take place within, causing the death of the central tissues. Their appearance and consistence in this way resemble that of cheese.

These nodules may vary in size from a pinhead to a cocoanut, often they are of stony hardness from the presence of lime salts. The tubercles may be confined to one organ or tissue of the body, such as the lymphatic glands, for example, of the mesentery or thorax, or the throat, udder, ovaries, etc., or they may be generalised throughout the body, the germs travelling in the blood circulation. In this way the abdominal organs (liver, spleen, kidneys, etc.) may all be involved as well as those of the thorax, lungs, pleura, lymph glands, etc. Often the pleura and peritoneum are covered with grape-like excrescences whose appearances are characteristic of this disease. Wherever tubercles are lodged for any length of time, much destruction occurs in the affected tissue.

The Tubercle Bacillus

Is described as a rod-shaped organism with rounded ends and a slight curve, requiring complex laboratory methods of cultivation and staining to prepare it for microscopic study.

It is a parasitic organism, which is only found in the bodies and excretions of animals affected by this disease. It thrives badly in the sunlight, which is said to kill it in from a few minutes to several hours. This fact should be remembered in dealing with it with a view to preventing tuberculosis.

The invasion of the animal's body by the entrance into it of living bacilli is effected either through the digestive organs (ingestion) or by the respiratory organs (inhalation), by transmission to the sexual organs when the testicle is invaded, and by inoculation, or by a cut or abraded surface.

Without the entrance of the living bacillus into the body, tuberculosis cannot affect it. It is the seed from which it grows, and it is as essential to the development of the disease as oats, peas, or potatoes are to reproduce these plants.

What Renders Cattle Susceptible to this Disease.

Impaired health, from whatever cause it arises, renders cattle susceptible to tuberculosis. Heredity has been proved not to be an active cause of its

propagation. It is well established by the experiments of Professor Bang and others that calves may be bred from tuberculous mothers, and if removed before the cow licks them or they have sucked their mother's milk, and placed in absolutely healthy surroundings and fed on milk from healthy cows, they can be reared and remain, so far as any inherited disease is concerned, perfectly free.

In-and-in breeding by producing animals with reduced vitality, over-milking, under-feeding, want of sunlight and pure air, insufficient exercise, breeding too young, are all what may be termed predisposing causes to tuberculosis, and should be avoided.

One breed of cattle is just as liable to contract this disease as another when subjected to the predisposing and exciting causes. Dairy cattle are most subject to it because they are more exposed—they are more congregated, more closely and continuously housed, their vitality more drained by heavy milking, and they are kept longer than the beef breeds. Their calves are more liable to milk infection, as they are fed on mixed milk, whereas the beef breeds usually suckle their calves. The majority of beef cattle are killed off at three or four years old, hence they are exposed to the contagion for a shorter term of life, which is spent more in the open air and in sunlight.

How the Disease is Usually Introduced into a Herd, and How it Extends in it.

A tuberculous bull is probably the most active agent in spreading this disease, both by cohabitation and sexual connection.

Farmers cannot be over-cautious in buying a bull or in having cows served by one till he has been subjected to the tuberculin test and found free from the disease.

Nothing should induce a breeder to allow contact with his healthy cattle by a bull till he has every assurance that he is free from tuberculosis.

Tuberculous animals of any kind should be prevented from coming in contact with the cattle.

Tuberculous Attendants.

Tuberculous attendants—men or women suffering from pulmonary consumption—should on no account be allowed to feed, milk, or have anything to do with cattle or pigs.

The intercommunicability of the disease from animals to man, and from man to animals, is an established fact no longer open to discussion.

The bacilli from the throat and lungs of diseased people or animals, being coughed up, adhere to and dry on the woodwork, walls, floors, and feed-boxes in buildings, cattle trucks, or stock yards, and the dust being moved about by air currents, being inhaled, infests the respiratory organs, the bacilli gain access to the blood stream or lymphatic glands, or, mixing with the food in the hay-rack or feed-trough, find access to the stomach and intestines, thence through the blood or lymph channels to the abdominal glands and other organs.

Danger from Milk.

The virulence of milk from tuberculous cattle, especially when the udder is diseased, has been clearly demonstrated. It will communicate the disease even when diluted by mixing with large quantities of other milk in the creamery or cheese factory; whey is equally dangerous. Milk from cows in advanced stages of generalised tuberculosis is also dangerous, but milk from cows in early stages of localised tuberculosis may not prove infective to calves or persons fed on it. It should, however, be sterilised by heat before being used.

The germs remain active in the skim-milk and whey, and may produce the disease in calves fed on it. Milk obtained from creameries in districts where tuberculosis prevails should be raised in temperature for ten minutes to 180° F. before being given to calves, otherwise living bacilli may be taken into the stomach, and, entering the lymph channels, produce the disease. As a precautionary measure, milk from tuberculous cows should not be received at creameries or cheese factories. Unless this is done creameries and cheese factories may become distributing agents of this disease to healthy herds. Milk from tuberculous cows is a frequent source of communicating the disease from cattle to people, especially children and old feeble persons.

How to Prevent its Introduction to a Herd.

See that your animals to begin with are free from the disease.

Never bring any animal into the byre till you have ascertained beyond a doubt that it is healthy.

Keep your own bull. Your neighbour may be obliging, but if careless about the health of his stock, you may suffer irreparable injury by accepting even the free use of his bull, should the animal happen to be tuberculous.

Conversely, if you have a bull, be exceedingly careful to see that no tuberculous cows are brought to him for service.

Never allow a consumptive person to have anything to do with your cattle; make no mistake about this.

Your byres must be well lighted—almost as light as outdoors; disease germs are killed by sunlight.

Pure air and plenty of it is essential to health. This can only be provided by sufficient space. Let your cow stable be roomy.

Drainage is essential to the purity of the air. Without proper and efficient drainage the air must become contaminated by the emanations from the droppings and urine of the cattle, as well as by the decomposing vegetable matters with which they are mixed.

Drain your buildings, and do it thoroughly.

The ventilation is all-important. By properly arranged ventilators the impure air is removed and replaced by pure. The oxygen of the air is constantly being consumed in the process of breathing, and unless it is replaced it becomes unfit to sustain animal life. The constant change of the air in buildings inhabited by animals is absolutely necessary to preserve health.

During summer weather most buildings are sufficiently ventilated by the doors and windows being left open; it is during the winter, when cattle are housed, that they suffer from imperfect ventilation.

Proper ventilation provides for the admission of the pure and the escape of the foul air. As a rule, farmers' architects do not make sufficient provision for either. The air may be admitted by openings near the floor and by windows hinged at the bottom and dropping inward. The ventilators or air-shafts are usually too small. Most buildings require shafts three feet square, placed about twenty feet apart, in the middle aisle of the byre. The shafts should be divided inside into two by a partition extending from the top to within three feet of the ceiling, the opening being controlled by trap-doors opened or closed by cords running through pulleys.

Cattle Standing Head to Head Objectionable.

The common plan of arranging the byre, so as to save labour in feeding, by having an alleyway with the heads of the cattle opposite each other, is objectionable from a health standpoint, as it exposes animals opposite tuberculous cattle much more to the contagion than when they are placed with their heads to the wall. They may be easier fed the former way, but they are easier cleaned the latter, and it has a decided sanitary advantage should contagious disease exist. Running water in troughs placed in front of the cattle is objectionable if tuberculosis is present, as by this means the germs may be carried to the whole herd.

Symptoms and Diagnosis of Tuberculosis.

In the majority of cases the symptoms are obscure, and till the discovery by Professor Koch of the reaction produced by the injection of tuberculin (being a most reliable test for discovering this disease in obscure cases unrecognisable by symptoms), the majority of cases could not be detected even by experts.

When affecting the lungs, throat, and respiratory organs generally it is accompanied by a frequent cough, but no fever. There is disturbance of respiration, the breathing is quickened by slight exertion or excitement, the cough is produced by changes of temperature. The expert can detect dull spots surrounded by areas of increased resonance on examination of the lungs by the usual methods. Usually the superficial glands in the throat, between the jaws, under the ear or the udder, may be hard and swollen. The animals may continue for months or even years to maintain fair condition; they are sometimes fat, while the lungs may be found studded by large tubercular masses.

When the disease is abdominal and the glands and organs in the belly are chiefly affected, the symptoms of defective nutrition are early apparent—emaciation, lessened secretion of milk, indigestion, breathlessness, and general failure more or less rapid. Many cases cannot be detected by symptoms, but can be almost to a certainty by the tuberculin test.

The Tuberculin Test.

Until the discovery by Professor Koch, in his experiments to find a cure for consumption in human beings, that the injection of tuberculin invariably caused a rise in temperature when the person or animal was tuberculous, while it produced no effect whatever when free from it, the detection of the disease in early stages or when slightly affected was considered impossible in most cases. This test is most delicate and reliable (about 98 per cent.) where it is properly applied.

Tuberculin is a soluble product of cultures of tubercle bacilli, of which a glycerine extract is made, which is sterilised by heat and filtered through porcelain, so that it contains no living germs, and therefore cannot produce tuberculosis in animals injected with it. It has, therefore, no effect on healthy animals; in some cases the disease is aggravated by it when it exists, but it cannot be produced by it.* The lymph must not be exposed to sunlight; it must not be frozen, and must be kept well corked to exclude air.

Tuberculin injection has no bad effects on the secretion of milk. The consensus of opinion of those most experienced is that it does not lessen the secretion of milk in dairy cattle, consequently they may be tested even when in full milk, without disturbing its secretion, unless it be during the few hours of its absorption.

It has never been known to cause abortion in cows or sterility in bulls, as has been claimed by its opponents; in fact, some breeders state that it lessens abortion.

The consensus of unprejudiced opinion is that it is harmless in cattle, even when tubercle is present, and in some cases it exercises curative influence.

Dose.—The dose varies with the size and age. As issued by the Department of Agriculture, it is ready for use, with doses marked on the bottle, viz.: twenty drops for calves, forty for small or medium-sized animals, sixty for larger, and eighty drops for very large ones.

When second tests are considered necessary, at least ninety days should elapse and the doses be slightly increased. Second tests are quite unreliable and often deceptive.

How to Deal with a Diseased Herd.

When tuberculosis is discovered in a herd, immediately remove the diseased ones from the healthy to an isolated stable, or a part of the byre may be partitioned off by close boards as far as possible from the rest of the herd.

In the case of low-priced cattle the owner will best serve his own interests by slaughtering them at once. When they are especially valuable and in calf, the experiments of Professor Bang and others show that the calf may be

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* It would be as reasonable to expect barley to grow from whisky placed in the ground as tubercle from injecting tuberculin into an animal body.

saved by removing it as soon as born, and before the cow has licked it or it has been suckled by its diseased mother, and by placing it in an uninfected building and feeding it on milk from tested cows it will in all probability grow up free from tuberculosis. The herd should be tested every six months, and those which react likewise removed till all trace of it disappears.

Disinfection of Premises.

Most careful and complete disinfection of buildings and yards in which diseased cattle have been kept should be employed to rid them of disease germs. In doing this, before sweeping, sprinkle the floors and walls thoroughly with water to prevent dust rising, removing drinking troughs, feed-boxes, and stall divisions. The floors must be specially scrubbed, the walls, ceilings, and partitions should be carefully washed, and all freely sprayed with a disinfectant solution, such as carbolic acid (one pint of crude acid to four gallons of water) or lime-wash. It may be applied by a whitewash brush or a spraying pump, care being taken to see that every corner, crack, and joint is thoroughly penetrated by it. The cleansing and disinfection should extend to drinking troughs and fences of the barn-yard, to make disinfection complete.

Disposal of Tuberculous Carcases.

Should the disease be local, as is frequently the case, being confined to one or more glands, the flesh can be used as food with impunity. Infection from flesh is an extremely rare occurrence, and most unlikely to occur if it has been thoroughly cooked. This can be most relied on when it is cooked in the minced form; deep-seated portions of large roasts may not be exposed to sufficient heat to kill the bacilli.

When on post-mortem examination the disease is found to be generalised, the carcase should be put into the rendering vat; the diseased viscera and tubercular masses should be burned or buried deeply in lime. No restriction is necessary on the sale and removal of hides, horns, hoofs, or hair.

Insurance.

At the Seventh International Veterinary Congress, held at Baden-Baden two years ago, Professor Siedamgrotzky suggested a system of insurance which, if it could be carried out, would be a common-sense way of lessening individual losses consequent on eradication by slaughter of clinically diseased and reacting animals. This is, however, surrounded by many practical difficulties, yet it is well worthy of the consideration of this Congress. An effort should be made to provide an indemnity fund by this or some other way, the public purse contributing a liberal share; otherwise, I fear the progress made in eradication will be slow.

In the State of Illinois, United States of America, indemnity is paid by the State on a plan which is worthy of imitation. A maximum value is

fixed at, say, £15. Diseased cattle are classified as follows after being slaughtered :—

		Indemnity.
Class A, in which no lesions are found	.	full appraised value.
„ B, in incipient stage	. . . .	75% „ „
„ C, infected for one year	. . .	50% „ „
„ D „ „ two years	. . .	35% „ „
„ E „ „ three „	. . .	25% „ „
„ F „ „ over three years	.	15% „ „

Should the proceeds of the sale of the carcase exceed the percentage valuation, the owner is paid the full amount so received.

Suggested Legislation.

No legislation will accomplish the end in view unless the measures are such that the public are in sympathy with them rather than antagonistic to them.

I. Tuberculosis should be included in the list of contagious diseases.

(*a*) Tuberculous animals should consequently come under the provisions of the Contagious Diseases (Animals) Act; but the local authorities should have power to allow the sale and movement of such parts of the carcases as are known not to carry contagion, such as hides, hoofs, horns, and hair, thus preventing unnecessary loss.

II. All foreign animals admitted for breeding or dairy purposes should be tested by the tuberculin test. Tuberculous animals should be prohibited from entering.

III. Tuberculin should be controlled, and none but qualified veterinarians be allowed to use it; and all reacting animals should be reported, marked, and quarantined.

IV. All animals showing clinical symptoms of tuberculosis, especially disease of the udder, lungs, uterus, or bowels, should be killed at once, and all scrub and grade animals reacting should be killed within six months. Pure-bred cattle may be bred from under Bang's system, in quarantine for life.

V. All testing, other than imported animals, should be by voluntary application for a test of the entire herd, and the expense should be borne by the State. A reaction of 2° to be understood to indicate tuberculosis, 1½° as suspicious. Suspicious animals to be quarantined and retested in three months, unless clinical symptoms develop, when they would be at once condemned. The Government to have the right to order re-test when considered necessary.

VI. Disinfection of premises should be ordered by special regulations, the carrying out of which will be superintended by Government officials.

The discussion on the Paper was opened by a delegate saying: May I

ask the speaker whether he intends these regulations to apply to Canada alone, or to this country?

To which Professor McEachran replied: The suggestion is general.

Mr. William Duthie said: I wish first to apologise for interfering in this discussion. It was only when I looked at the matter that has come before us this morning, and when I considered how important it was to us as breeders and as feeders, and to agriculturists generally in this country, that I thought at any rate I should voice some of the feeling that exists in our midst.

I hope you will allow me to make what may be called a sort of personal explanation with regard to a remark that fell from a fellow-Scotchman yesterday. He referred to the large party that came here to represent the butchers of Aberdeen.

I may say that the party to which I have the pleasure and honour to belong do not represent the butchers of Aberdeen only, although we have some of the very best, most respectable, and leading butchers in that city, which sends such splendid beef to the London market. But we have also traders and farmers from Kincardineshire, Morayshire, and Aberdeenshire. Although our occupations are various, our interests in this matter are the same. We are here to get information on this very important subject, and to lend what little influence we have to the stamping out of this most serious disease. Although there may be a slight inclination to laugh at us in this respect, I say that we are here in the public interest, and anything that we propose to ask of the people of this country and of the House of Commons and the House of Lords, we propose to ask, not in a narrow and selfish spirit, but on the important grounds of the public good. (Hear, hear.) I think I am speaking not only my own opinion, but the opinion of the party to which I belong. None of them knew I was going to intervene, but I believe I speak the opinions of all the gentlemen of that party when I say that we enjoyed beyond all expectations the Papers and discussions which have come before this department of the Congress. Especially I would say no Paper has interested me more, as a breeder of cattle, than the Paper we have just listened to. I have been following Mr. McEachran, who holds a most important position in the most important colony of this country, and I have followed him carefully, although I should have preferred if he had read his Paper completely.

I might say further, with regard to the party that has come from Aberdeen, that we are indebted very much to Mr. Murray, of Glenbounie Park, whose enthusiasm has induced so many of us to come from the North. If I follow the author aright, there are certain points he has referred to which I think are very interesting to us. I understand Mr. McEachran has recommended very much the spread of information, and the wide diffusion of it throughout the country, especially among breeders and feeders of cattle. That, I think, we all agree to. He referred to the disinfection and ventilation of our byres, or stables, as they are called in Canada, and to this also we give

our united adherence. From personal experience, I have found nothing to be more important than the cleansing and disinfecting most thoroughly of my byres every year after the cattle have left them to go to grazing, and I think that is generally adopted in practice by the people in our locality.

Another thing to which he referred is the ventilation of our byres, and this, I agree, is but partly understood. A great many of those who plan our byres do not quite understand the proper system of ventilation, and I think we Aberdeenshire farmers and breeders can learn a great deal in that respect. We want our byres thoroughly ventilated. Another thing we have to plead guilty to in Aberdeenshire is that we do not allow our cattle sufficient exercise and air during the winter months.

We live in a very uncongenial part of the country, where we are subject to severe weather, and often for days the whole place round the yard will be covered with ice, so that it is difficult to allow the cows to get out; but I may say that to allow our cattle exercise and open air and water outside every day would be a very great improvement.

Notwithstanding the difficulties, quite a few of us are now practising that plan. Another thing I have learned, not only from Mr. McEachran, but from other scientists who have spoken to us during these days, is that we have to be exceedingly careful with regard to the use of milk, both for children and adults, and for calves. I quite agree with this, because if a cow has any disease, even what we call "weed" in the north of Scotland, I do not allow the cow to suckle the calf. I stop until the quarter of the udder has become thoroughly dried up, and quite safe, before I allow the calf to take its milk from the cow. Nor do I think we farmers in the north of Scotland allow our farm hands and others to use milk from cows with diseased udders for food. We have also learned what a scare is in the north of Scotland, and this reference to meat is very much a scare.

There is very little danger in using beef of well-nourished cattle, even if they show here and there a little spot of what has been called tuberculosis.

I believe this has been a scare altogether. I do not mean for a moment to object to carcases that show what is called diffused tuberculosis being destroyed in the public interest, but I do object to this system which has been too largely carried out by some of our inspectors, at any rate—the system that if you find the breadth of a penny-piece in a valuable carcase, costing from £22 to £23, it should be sent away to be destroyed and used as manure. I think that is uncalled for. There comes in the importance of having a right system of inspection. There is another thing to which this Paper has called our attention, and that is, that although Canada has not yet seen its way to give compensation, nearly all the States in America are giving compensation; and therefore it is not anything fresh that we ask in this country when we ask for a reasonable system of compensation from the Government. I consider those admirable proposals we had before us to-day from Sir George were excellent indeed. I see Mr. McEachran speaks of the danger from the attendants, but I do not think that concerns the north of Scotland very much. Our boys are so hardy that we never have tuberculous

men attending cattle at all. They have good open air, good sunshine, and good food, and I have never had an attendant I could complain of in that respect. I thank you for listening to these few remarks, and I again congratulate Professor McEachran and other gentlemen who have spoken, and thank them for the enjoyment they have given to us.

Professor NOCARD, of Alfort, said: Tuberculosis is unquestionably *the* disease of beasts to which the agriculture of all countries pays the heaviest tax. It alone causes more ravages than all the other contagious diseases put together; whilst the others are only present at more or less frequent intervals, tuberculosis pursues its course of destruction incessantly and silently; it strikes without respite and without a truce, at all times, in all latitudes. Everywhere, in Europe, in America, in Australia, the number of tuberculous cattle is considerable. It is possible to form a fairly exact idea of it by consulting the statistics of public slaughter-houses, which are regularly inspected.

During the year 1898, the cattle slaughtered in the public slaughter-houses in the kingdom of Prussia numbered over 700,000. The number of those which were tuberculous rose to 16·09 per cent. In the kingdom of Saxony, in the same year, the percentage was 30·46. In 1897, at the abattoir in Amsterdam, 9·40 per cent. of the cattle were tuberculous. At Leyden the proportion reached 9·99 per cent. At Copenhagen, in 1895, it rose to 29·5 per cent. At Milan it varied from 25 to 30 per cent. for cows from Lombardy. In Moscow it was, in 1894, 7·26 per cent.

These figures, though high enough, are however below the mark, for the owners take care not to send animals suspected to be tuberculous to a slaughter-house which is inspected; in order not to expose them to seizure, they have been killed in private slaughter-houses, which swarm in the country and on the outskirts of large towns, these being exempt from all inspection. Great Britain is not less seriously infected; inspection of slaughter-houses is still in its infancy; nevertheless, it is from this country that we obtain the most precise statistics. In the course of the admirable campaign which the English recently undertook against contagious pleuro-pneumonia, and which has ended so speedily with the complete disappearance of this disease, which had been rife for fifty years, 13,880 animals of all ages and from all parts of the country were killed during the years 1891 and 1892. Post-mortem examinations were made in all cases, and 2065 were found to be tuberculous, making a proportion of 14·88 per cent. The percentage reached 18·70 in the county of Durham, 20 per cent. in Yorkshire, 25 per cent. in the cow-byres of London, and 26 per cent. in those of Edinburgh. An official Belgian report, dated 1896, shows us that out of 19,000 cattle submitted to the tuberculin test, 48·8 have reacted. In Sweden, tuberculin applied to 36,000 cattle has revealed 42·2 per cent. It dealt in reality with cases which for the most part had been infected for a long time. In France there is not any official document allowing one to estimate even approximately the proportion of tuberculous cattle. We know that certain districts are almost free from it—Auvergne, the greater part of Limousin, and Normandy, for

instance; but we know also many other provinces which are seriously affected—Champagne, Lorraine, Brittany, Flanders, Béarn, Brie, etc. In Beance, the most experienced of veterinary surgeons estimate that more than a quarter of their bovine population is tuberculous. America is as seriously affected as Europe. If the reports coming from the United States are often at variance, they are always alarming. In New York, Blaine examined 4000 animals; 21 per cent. were tuberculous. In certain districts of Massachusetts Osgood found them up to 80 per cent. Out of 17,000 animals submitted to the tuberculin proof, 9500 which reacted were killed, making more than 55 per cent. In Iowa, Stalker and Niles give the figures at 14 per cent.; in 1896 the number of tuberculous cows in the dairy farms was estimated at 50 per cent. In Mexico, the proportion, according to Fleming, should work out at about 34 per cent. In the Argentine Republic, the disease, which is very rare in indigenous cattle, attacks from 8 to 10 per cent. of the imported or cross-bred animals; the same thing may be said of Chile, where the percentage rises to 30 per cent. amongst pure or cross-bred shorthorns. In Australia, 10 to 20 per cent. of the animals killed in the slaughter-houses of the State of Victoria were tuberculous. An official report in 1885 estimated the tuberculous animals in all the territory at 7 per cent. In Japan, the indigenous races are again immune, but Janson estimates at 50 per cent. the number of tuberculous ones among those that are imported from England or from the United States. These figures, already so very alarming, acquire a more terrible importance still if they are compared with statistics taken some time previously. From this comparison it is found out that tuberculosis is increasing, that everywhere it spreads with a horrible rapidity. Again, it is outside France that one must go to seek precise and convincing documents. In Prussia, the number of animals recognised as tuberculous in the public slaughter-houses rose, progressively from 1891 to 1898, from 8·1 per cent. to 16·09 per cent. In Saxony the increase went on (in the same period, 1891–1898) from 16·4 to 30·36 per cent. In 1891, at Copenhagen, the percentage was only 16·60 per cent.; but in 1895 it was 29·5. At Amsterdam, in ten years (from 1888 to 1897), the proportion rose from 1·7 to 9·4 per cent. At Leipzig, where they registered, in 1888, 11·1 per cent. of tuberculous animals, in 1897 the figure was 36·4 per cent.

At Kiel, the percentage rose in seven years (1899 to 1895) from 8·8 to 41·03 per cent. At Zwickau, in four years (1894 to 1897) it rose from 26·6 to 45·1 per cent.

The infection of tuberculosis is not to be compared with that of foot-and-mouth disease, rinderpest, sheep pox, swine fever, or of pneumo-enteritis of the pig. In all these diseases, the slightest contact with an animal attacked, or even by objects tainted by it, is enough to ensure transmission. In tuberculosis, on the contrary, it is only after some time—the result from repeated contact, intimate and prolonged, such as being permanently placed in narrow and badly ventilated stables in the immediate neighbourhood of the diseased ones—that infection results. This allows us to understand why the contagion of tuberculosis is an exceptional thing in the pastures; also why the disease,

formerly so frequent in the cow-byres of Paris, has become rare there since the cow-keepers have given up turning out their cows, buying them newly calved, in full milk, selling them to the butcher as soon as the secretion of milk dries up; during their short sojourn in the stables, scarcely a year with most cows, they have not time to become phthisical and to contaminate others.

When one has the misfortune to introduce into a stable a tuberculous cow, and this cow remains there, the cow-shed cannot escape infection, the contagion is installed there to stay: from thenceforth it does not depart, and all the inhabitants of the stable, with very rare exceptions, become tuberculous one after another. It has always been the same, years ago as to-day, the infected byre remains permanently infected, and all the animals which succeed one another there become tuberculous one after another. But that which has made the situation much more serious at the present time is that the number of infected stables goes on increasing in proportion with the circulation of the cattle and with the ease of the sale of which they are the object; every day, too, one sees the opportunities of infection multiply in stables which have had up till now an opportunity to escape. There is one other cause again for the propagation of tuberculosis: that is the co-operative dairy companies, which have contributed so largely to the prosperity of the milk trade in Denmark, and which have increased a little all over Europe in the breeding centres. The waste products left after the manufacture of butter and cheese are restored to the owners, in the proportion of the milk which has been sent; they are utilised for the nourishment of the animals, calves or pigs, and often, when it is merely a question of skim milk, for the nourishment of man. If amongst the shareholders of the company there happens to be one who possesses cows tainted with tuberculosis, the whole stock of milk dealt with in the works and all the animals which are fed on the remainders can be contaminated; a single infected case can thus infect at a single stroke a great number of cases. This serious danger brought forth in Denmark the law of March 26th, 1896, which ordains not only that every cow recognised as attacked with tuberculous mammitis should be killed immediately, but which forbids, before everything else, every brewery or cheese factory giving out the subsidiary products of their manufactory without first having pasteurised them to a temperature at least of 85 degrees Centigrade. This salutary measure recommends itself to all countries with like industries. As contagion takes the principal part in the progress of the disease, it would be enough, in order to put an end to it, to separate the healthy animals; but before isolating the sick ones, they must be able to be recognised, and nothing is more difficult than making a diagnosis of tuberculosis in cattle, even in an advanced period of the disease, when one is reduced entirely to decidedly clinical symptoms. More often the tuberculous animal offers no sign which makes it suspicious; up to these later days the difficulties of diagnosis were so great as to make all attempt at prophylaxis useless.

It is not so to-day; we possess in tuberculin a simple and effective means of recognising tuberculosis in cattle, even at the outset, even when it does not betray itself by any sign which shows a suspicion of its existence.

It is by hundreds of thousands that, to-day, experience proves the incomparable diagnostic value of tuberculin everywhere in all countries. These experiences have given the same convincing results; the latest and most limited lesions are revealed with the same precision, the same certainty as those which have invaded the greater part of the lungs. In the healthy animal tuberculin produces no effect, not even in those attacked by any disease other than tuberculosis; in fact, the inoculation is absolutely without danger; it brings no trouble to the pregnant animal; it alters nothing in health, and affects neither the quantity nor the quality of the milk produced.

It is thus possible to-day, in an infected stable, to part the healthy animals from the sick animals and to effect their isolation, thanks to which the contagion will cease to make fresh victims.

The isolation of the diseased is the basis of prophylaxis of bovine tuberculosis; but this measure, necessary at first, is not enough in itself to ensure the definite disappearance of the disease.

A special new stable, or one carefully disinfected, must be assigned to the healthy animals; then they must there be protected from fresh infection. For the latter it is enough only to introduce into the stables healthy animals which have passed the tuberculin test. It would be necessary again to use for the nourishment of the calves food which has had no risk of tuberculous infection. The milk, if it is furnished by cows which have reacted from tuberculin, and the residues of the manufacture of butter and cheese, whatever they may be, ought to be boiled or carefully pasteurised before being offered to the young animals.

We have related above how Denmark protected itself from this danger. One cannot too strongly recommend other countries to follow its example.

What must be done with animals recognised by tuberculin injection as tuberculous? Ought they to be killed? This would be a ruinous and excessive measure; it is only imposed with regard to those which present visible symptoms, the clinical signs of the disease (a frequent cough, expectoration, swelling or induration of the lymphatic glands or udders, stethoscopic signs, etc.), in fact, those which have arrived at an advanced stage of the disease; they are eminently dangerous from the point of view of contagion, and one cannot hope for any real benefit from their preservation. The interest even of the owner lies in giving them up to be killed with only the slightest delay. It is for these animals that the French sanitary regulations prescribe immediate slaughter.

As to the others, those which present no external sign of the disease—and these are unhappily the most numerous, even in the most seriously infected stables—it is not necessary to have them killed very quickly. Experience demonstrates that the largest number of them have only lesions recent or of slight extent, often insignificant. Their general condition is satisfactory; they are infinitely less dangerous than the first in point of contagion; therefore one can keep them and continue to make use of them. Cows can be allowed to breed so long as they are young and in good condition; their calves will be born healthy and will remain healthy, the only necessary

condition being separation from their mothers immediately after birth, by taking them out of the infected stable and feeding them on boiled milk.

The only rules which are formed with regard to this group of animals are to keep them rigorously isolated from the group of healthy animals and to prevent their sale for any other purpose than slaughter.

From that which has gone before I think we can draw the following conclusions :—

(*a*) Tuberculosis is one of the diseases of cattle which cause most loss to agriculture in all countries.

(*b*) Everywhere the disease is on the increase; everywhere it forms a menacing danger to public health as well as to public wealth.

(*c*) Infection being the only formidable cause of the increase of tuberculosis, there is need for the adoption of legal measures prescribing :—

1. The complete separation of unhealthy from healthy animals;
2. The slaughtering, without delay, of those sick animals which show clinical signs of the disease, and especially of cows attacked with tuberculous mastitis;
3. The interdiction from selling other tuberculous animals for a destination other than the slaughter-house.
4. The pasteurisation of all the sub-products of butter and cheese manufactories.

Professor THOMASSEN, of Utrecht, made the following remarks :—

When I decided to take part in this discussion, I scarcely thought that it would attain to such great importance as it has from the unexpected communication of Dr. Koch to the general meeting on Tuesday last, where we heard that the illustrious professor had not succeeded in communicating tuberculosis to cattle by means of the human tubercle bacillus.

Certainly Professor Koch's communication has caused a great sensation to-day, and has opened up an important point for further research. That everybody is not of Professor Koch's opinion you have already heard from Messrs. Nocard, Bang, McFadyean, and Woodhead, and I endorse their opinions and give you proofs, one by one, afterwards dealing in general terms with the question.

I have here a short *résumé* of the new law recently brought before the Legislative Assembly in Holland, and I propose adding a few remarks which I consider necessary.

The fundamental principles on which a law aiming at suppressing bovine tuberculosis, and on which our new Bill is mainly based, are the following :—

1. Obligatory notification, on the part of the owner, of every case in which he suspects the existence of tuberculosis, or, failing this, to favour by all means, especially by compensation for condemned animals, optional notification. The veterinary practitioner (by the help of the law of 1874) and the veterinary inspector of meat should be obliged to make the notification of all

cases, both those discovered during the life of the animal or by a post-mortem. (The compulsory inspection of meat favours this measure.)

2. In the byre where tuberculosis has been certified, all the animals ought to be injected with tuberculin, and in case of non-reaction, again every six months.

3. All the animals which show a typical reaction should be strictly isolated, at least as far as possible, from animals supposed to be unaffected and where no reaction has taken place.

4. The tuberculin injections shall be exclusively made by certificated veterinary surgeons. The preparation of tuberculin shall take place under the control of a veterinary surgeon.

5. Animals which have reacted can only be sold for slaughter after a certain time has elapsed. (Our Bill fixes this delay at eighteen months.)

6. All the animals in which external symptoms of tuberculosis have been discovered, that is to say, in whose secretions or excretions the bacillus has been found (especially in the case of a tuberculous milk yielder), shall be killed as soon as possible; half the value of the animals when in a healthy state shall be awarded.

7. Calves born of tuberculous mothers shall be transferred immediately after birth into an uncontaminated place and fed with boiled milk.

8. The refuse of butter factories shall be sterilised and partly destroyed.

9. The isolation of tuberculous animals shall be strictly enforced.

10. There shall be a revision of the law after a fixed time (as in Denmark), at the least after five years.

Under our law there is no question of pigs; it is thought that by eradicating bovine tuberculosis, porcine tuberculosis will also disappear.

Colonel NUNN said: I have really little to say about the matter; but I was asked to make a few remarks, and I presume the reason I was asked to make those remarks is that I happen to be a barrister as well as a veterinary surgeon. The subject of the discussion is legislation with reference to tuberculosis, and in this Congress we have had, if I may use the term, rather a startling theory. Into that I will not go. But to veterinary surgeons and stock-owners the question arises, Is it desirable to eradicate this disease in cattle or not? The matter of incommunicability to human beings I leave out of the question. I think on all hands it is universally acknowledged that it is desirable to eradicate this complaint. Starting with that, the question of legislation is, to a non-legal person, perhaps slightly misleading. It usually means Parliamentary powers. I hold in my hand the Contagious Diseases (Animals) Act, 1878, and Section 32 of the Act states that the Privy Council may from time to time make such general or special orders as they think fit, subject and according to the provisions of this Act, "for the following purposes, or any of them." It gives a number of them. Sub-section 32 of the Act states: "For extending to all or any purposes of this Act the definition of disease in this Act so that the same shall for these purposes comprise any disease of animals in addition to diseases mentioned in this Act." Sub-section 34 says: "Generally for the better execution of this Act or for the

purpose of in any manner preventing the spread of the disease." There appears to me there, gentlemen, to be ample Parliamentary powers. The powers of the Privy Council have been conferred on the county councils, and it appears to me, as stated by the reader of the Paper, that our duty is to educate the public up to the point that, not legislative, but executive power is necessary; educate the public up to the point, and force the executive to do it.

Professor EDGAR said: It may be humiliating for parents to learn from their children, but we have had a lesson from Canada this morning, and we ought to profit by it. It has certainly shown us how far the colonies are beyond the mother-country in attempting to suppress diseases of animals. The veterinary profession of this country has been for many years advocating enactments against tuberculosis, and the profession is unanimous that such enactments should be passed. We have been pressing for twenty years for the inclusion of tuberculosis in the Contagious Diseases (Animals) Act, in order that some repressive steps should be taken, and the chief obstacle to that has been hitherto the impossibility of veterinary surgeons diagnosing the disease. We have clearly seen that both from the medical and the veterinary standpoint that obstacle is removed with regard to tuberculosis, and we may go on attempting to educate the British public another thirty years, and we shall not be further ahead than we are now, if we do not take some legislative steps. Professor Brown wrote thirty years ago concerning this disease in the *Veterinarian*, and although then it was an almost unknown malady to the inspectors of the Metropolitan Cattle Market and the professors of the Veterinary College, within thirty years that disease has spread until we are now told on very good authority that 30 to 40 per cent. of the cattle in this country is affected with the disease. It will take another ten years to thoroughly educate the public, because they learn very slowly, and another ten years to educate the public into believing that legislative steps are necessary. It is now that we want to act. (Hear, hear.) Restrictive measures must be made if anything satisfactory is to be done, universal and uniform, and not left to the "may if they think fit" of local authorities. Then, whatever powers are given from the central authority in the land, they should be administered by local authorities to ensure promptness and to stimulate local interest in the suppression of the disease. Where any Acts are administered through the central authority alone, a general apathy in local places exists, and everyone thinks, "It is not my business to interfere with this matter, and therefore I shall not do so." If that occurs with regard to tuberculosis, not much progress will be made. It is a very difficult matter to deal with. It is difficult for local authorities to do what is right, especially with regard to affected cows in dairy-sheds. Some local authorities, being progressive, are bringing the powers they have to bear, and in my own district our local authority has an inspection made once in four months. That is a very good beginning; but if I see a cow which is suspect to-day, I shall not see that cow again for three months, and during that time tuberculosis may develop to a large extent in the cow's udder, and I have no power whatever to stop her.

I know a case in point where a badly tubercular cow was turned out by our local authority. She was giving fifteen quarts of milk a day, with advanced tuberculosis. She was sent to another market outside Kent, and sold again; and probably that process will go on again and again before that cow is killed. We were told yesterday it was a scandal. We see it with our eyes, and we are powerless to do anything to stop the present state of things. Are we to wait until the public are educated? No; we require immediate powers in order to suppress this kind of trade. I would like to point to one very important blemish in this valuable Paper of Professor McEachran's. He suggests twice over that no restriction is necessary on the sale or removal of hides, horns, hoofs and hair, and he suggests in Clause "A" that in order to promote economy in the eradication of this disease, the sale of these things should be permitted. Would Professor McEachran like to say that he considers it absolutely safe, and that we should consider there are no tubercle bacilli in the hair of a cow slaughtered by the ordinary butcher? All the offal is scraped and heaped up together and used as manure on the farm. After taking care to eradicate tubercular disease at great expense, you bring it again on to the farm as manure, and let the cattle eat the bacilli. It is done over and over again in anthrax, and it is unsafe. Three weeks ago the Turkish Government stopped a very important parcel of machinery from a very large cold-air manufacturing firm in this country because the machinery was packed in cow hair. They refused to allow it to pass into Turkey until a certificate from an English veterinary surgeon had been given to say that the cow hair was innocuous. I was asked to give a certificate, but I said as I had not seen the cow hair, I did not know whether it contained anthrax or other bacilli, and I could not give a certificate. If Turkey is so progressive, is it safe to allow the hair of a tuberculous cow to be indiscriminately scattered amongst the farmers, after so much trouble and expense has been incurred to eradicate the disease?

A DELEGATE then rose and said: I should like to ask Professor Edgar one question. Does he adhere to the statement that there are 30 or 40 per cent. of the cattle in this country tuberculous?

Professor EDGAR replied: We learned on good authority that from 30 to 40 per cent. were so. I do not know of any absolute statistics.

The DELEGATE then said: I never heard such a statement made. I have heard the statement made that 30 per cent. of the cows of this country were tuberculous, but I never heard of 30 or 40 per cent. of cattle.

Professor DEWAR then rose and said: In connection with this subject I wish to devote a few minutes to some of the measures mentioned in the heading of this section which is being discussed to-day, and the remarks I have to make are in connection with the suppression of tuberculosis apart from legal enactments. I am glad to see there are some hard-headed intelligent farmers present, and I hope they will make a note of the remarks

I am going to make. There has been a great deal of exaggeration spread abroad as to the expense which is likely to be incurred by any individual breeder who, on his own initiative, starts to clear his herd of tuberculosis. I would like to try and convince some of those before me that instead of its being ruinous, it may be the most valuable thing they ever attempted. Subsequent to the publication of the earlier results of Professor Bang—whom I am glad to see with us to-day—in the session of 1894–95, I was entrusted with the testing of a herd of valuable breeding animals for the purpose of eradicating suspected tuberculosis from it. I wish here to state—and I hope Professor Bang will attend to this—that had I insisted on his mode of procedure being followed out to the letter, it is just possible that this effort would never have been made. But I advised that the calves of reacting cows should be allowed to suck their dam, that they should not be penned up beside them, that they should have plenty of fresh air and exercise, and that on being weaned and housed in the autumn they should be kept entirely separate. On the first occasion of testing this herd—not a particularly large one—it caused what I might term a bit of a scare. The reactions were not so great as have been indicated here to-day possibly, but in the first testing thirteen cows and three heifers reacted. I wish to trace these animals, to show that it is not really so expensive as on the first aspect would seem to be the case. From these thirteen cows ten healthy calves were reared; and when I say healthy, I mean that these calves were tested at from six to nine months old and failed to react. Of these sixteen reacting animals eight were slaughtered during the year, and I should like you to observe the reasons for their being slaughtered. One had aborted, two had dead calves, one had a bad udder, two had bulled, and two were rather indifferent animals, which the owner thought were not worth his while to keep for breeding purposes. This left eight reacting animals to be brought forward next year, and when the test was applied we found two, which had not reacted in the previous year, reacted. This made ten animals, and from these ten cows nine calves were reared—calves which their dams had suckled. During the course of this year one of these ten animals was slaughtered, because she had aborted. The following year nine of these animals were still left, and we found that one was to be added which had been infected for a reason which I thought I understood—this animal had come into contact with a tuberculous animal, one which the breeder had bought and proved, by testing, to be tuberculous. From these eleven tuberculous females eight sound healthy calves were reared, and one reacted to the tuberculin test. Of these eleven animals five were slaughtered during this year, one that had aborted, one that was the mother of the calf that reacted, who turned out to be a buller herself, and three of them did not settle to the bull. This left in the following year six cows and two animals bought in which, I am sorry to say, again reacted to the tuberculin test. From these eight reacting animals eight healthy calves were reared. One of these eight was slaughtered this year simply because she did not turn out to be in calf. We had seven left from the former year, and from these only five healthy calves were reared. Four of the seven were slaughtered

this year because they did not settle to the bull, and one of them had a bad udder. This leaves now only three animals which reacted to the tuberculin test, and from these three this season three calves have been reared, which I hope will prove to be healthy, but as yet the test has not been applied. I wish to point out that of these twenty-four reacting cows and heifers three are still alive, and only one has been buried; that is to say, twenty-one have been disposed of. This one was clinically affected when the test was first applied, and it was certainly not due to the tuberculin test that she had to be buried. The tuberculin test I hold in this case was of profit to the breeder, as he got rid of this animal, which I have no doubt would ultimately have had to be buried, and thus save a good deal of keep, and perhaps some veterinary treatment. Of the other twenty animals, after slaughter the whole twenty carcases were passed as fit for human food. Now as to the usefulness of these reacting animals for breeders. Before going further I may say that during this time forty-eight calves had been reared, and forty-seven of these had proved healthy; that is to say, they did not react to the tuberculin test when it was applied to the calves when they were six to nine months old, and only one of all those suckled by reacting dams reacted to the tuberculin test. As to the usefulness of reacting animals as breeders, I may say that several had three calves, one four, one five, two six, and one seven. As to the seventh calf I cannot speak, but the six calves failed to react when the test was applied. The calves were not all reared. Those I have mentioned were reared, but some calves died, most of them within a few weeks of birth, and in all probability would have died had their mothers not reacted to the tuberculin test. Where does the expense come in? Only one of these animals was buried, and I venture to affirm that had the test not been applied there would have been a few more funerals. I can assure breeders there is little use for a veterinary surgeon in a herd which has been thoroughly tested. There are fewer abortions, fewer ingestions, and less disease of all kinds. Although two farmsteads are not necessary for successfully carrying out the test, yet I cannot help saying that the owner of valuable animals who has two separate homesteads and fails to have his stock tested, with the view to the separation of the disease, is neglecting his own interests. It is cheap philanthropy when the undoubted profits go into the pockets of the philanthropist.

Mr. DUTHIE then said: I would like to ask Professor Dewar what became of the forty-six calves; whether they were tested when they were one year old, two years old, and so on, and continued to be healthy?

Professor DEWAR replied: I can assure Mr. Duthie and other gentlemen present that I was not able to follow up these forty-seven calves, but you have heard enough since you attended this Congress to know that we put very little faith now in the heredity of tuberculosis in animals. From these animals being tested months after they were weaned we take it for granted that they had not inherited tuberculosis from their dams, or had not contracted it by

being suckled by their dams, and we have every reason to believe that these calves have the same chance to remain healthy, unless exposed to the danger of tuberculosis, as though they had been out of cows that failed to react.

Another DELEGATE then asked: Is not it a well-known fact that more calves have died through skit than all other sources combined, and that calves can be kept in warm surroundings better than when exposed to cold?

Professor DEWAR answered: Sir George Brown has left the Chair, or I am afraid I would not have been allowed to answer that question.

Mr. A. C. COPE (who occupied the Chair in the temporary absence of Sir George Brown) then said: You will not be allowed to answer it now.

Mr. WILLIAM HUNTING entered the discussion by saying: I intend to confine the few remarks I propose to make to the subject of legislation for tuberculosis. At present it is said that we have some legislation. There is some legislation against tuberculosis, it is true, but very little, and that confined entirely to the protection of the human subject against meat and milk. Anybody who will read the reports of the medical officers of health, and who has noticed some of the prosecutions that failed, will know that the whole thing is an absolute farce. (Hear, hear.) When you suspect tubercle bacilli in milk, you have to examine it with a microscope, and you generally find nothing. Then you inoculate guinea-pigs with it, and in about a month you discover that there is a tuberculous udder in the shed. By that time forty children might have been poisoned, but until you have discovered it you can do nothing, and when you have discovered it you find the cow has gone, and you will probably find it in the next shed or the next town. How a Government could possibly have put into action such nonsense as this I do not know. The only apology is that Mr. Chaplin was head of the department at the time. (Laughter.) Then as to meat, there is supposed to be some protective legislation against tuberculous meat, and we employ veterinary inspectors at some of the larger abattoirs. Well, it is a very remarkable thing that there are butchers so conservative that they have got into the habit of sending tuberculous cows to the market, and still continue to send them there. But, as a rule, in about a year, or a year and a half, a veterinary inspector at an abattoir stops the flow of tuberculous cattle into that abattoir, and then they go to the private shops. About half the proper quantity of meat is inspected in some way, and the other half is not inspected at all. It is not likely that when a man has lost a few tuberculous cows at an abattoir he will send them there again. He has a friend, probably, who has a shed in a back street, and he sends them there to be killed.

A DELEGATE: That is not so.

Mr. HUNTING: But I know it is so.

The DELEGATE: I think it is only right that Mr. Hunting should give us details.

Mr. HUNTING: I daresay I might do that.

The DELEGATE: It is your duty. A serious charge is being made against the trade, and it ought to be confirmed or apologised for.

Mr. HUNTING: About the worst case of tuberculosis I ever saw was reported to me, as inspector for the district, as pleuro-pneumonia. The man knew it was tuberculosis, and he thought he might get compensation for pleuro-pneumonia. I refused. But, to oblige him, I followed the animal to the slaughter-house where it had been killed, and saw it there. I had nothing to do with tuberculosis, and the people of Chelsea ate it! That is only one side of the question. Four-fifths of the inspection is carried out by many who know nothing about it, and nearly the whole of the other fifth by men who know too much, with the result that the medical officer of health in many towns condemns the animal if it has one nodule in its lung, or as Professor McFadyean said yesterday, if it has a few grey tubercules or a little nodule in its lung. For an absolutely local disease he seizes the whole carcase. There again, I say that the inspection, as carried out at the present time, in nine-tenths of the cases is an absolute farce, just as much as the milk inspection—a farce when it is not an injustice. (Hear, hear.) Is any legal measure necessary? I like to take a cautious and moderate man's opinions on these things, and sometimes I am not included in that classification. Professor McFadyean told us yesterday that so far as part of this subject goes, the present state of the law, or rather the almost entire absence of any law dealing with tuberculous udder disease in cows, is a scandal and reproach to civilisation. That is a moderate way of expressing it. (Laughter.) What I want to ask is, If it is so particularly dangerous to leave a cow in a shed with a diseased udder, is it not also dangerous to leave an old waster, who is emitting bacilli from both ends during the whole of her life—tubercular diarrhœa is extremely common—in a cow-shed? Saliva and excretions are full of bacilli. What happens? The tail keeps whisking about, the udder gets dirty, and the shed is saturated with material containing tubercle bacilli. The gentlemen who believe very strongly that inhalation is the common method of conveying tuberculosis, cannot get over the fact that there are even greater and more constant dangers in that shed than the presence of one quarter of one cow being wrong. Why in the world should they legislate for an udder and not legislate for the millions of bacteria which are disseminated by saliva and other things? Of course I recognise there are some difficulties in legislation. Professor Dewar says that the greatest obstacle to the successful action against tuberculosis, whether in man or animals, is the ignorance of the laity regarding the cost of the disease. I do not think that is quite correct. My own opinion is that the greatest obstacle is the eternal reiteration of this ignorance by the experts and by the authorities. It is the grandest excuse they can possibly

make, and the man who is always harping upon the ignorance of the public, and the thirty years which it will take to teach them, is never likely to do much good. All he does is to furnish a handle to the Board of Agriculture for sitting still and drawing their salary. (Laughter.) Is legislation not of itself the best educational method we could adopt? Until we made rules for the cattle plague, pleuro-pneumonia, and foot-and-mouth disease, did ever any agriculturist pay any attention to it? Not a bit. We should have had no cattle in the country had they tried to educate him; but they gave him forty shillings or a month.

Mr. WILLIAM COOPER, interposing, said: The speaker is now trespassing on something which is not a fact. The legislation against cattle plague was initiated in Aberdeenshire and nowhere else.

Mr. HUNTING then said: It is no good contradicting a man who knows, and I know something about it as well as you do.

Mr. COOPER said: Ask the Chairman; he knows.

Mr. HUNTING replied: So do I. What happened? They gave him forty shillings or a month, and that educated him pretty quickly. Now we come to pleuro-pneumonia. They would not be educated on pleuro-pneumonia—not even with forty shillings or a month—until the pedigree men found their pockets were being touched, when pedigree animals were stopped from going to foreign shores—and then the Royal Agricultural Society, which consists of pedigree men and landowners, awoke to the fact that something should be done, and something was done, with the result that the disease was stamped out. It is a matter of self-interest, and when you can show them that their interest is going to be affected, then they will see the right way. Now what I propose to do is to try and demonstrate that it is quite possible by simple methods, applied uniformly, to include legislation which will affect the meat and milk question, do no harm to anybody, and protect us more than the existing legislation does, at the same time that the farmer and breeder has his share of it. If you put this disease into the Diseases of Animals Act, schedule it according to the existing Act of Parliament, notification is required, and that notification would cover not only the udder cases, but any other symptoms which were shown by the animal—in fact, it would catch nearly every animal which was in such a condition that it could do harm to other animals or to human beings. It would affect the disease in the hands of the breeder, and that is where it starts; it would affect it in the hands of the feeder, and that is where it is continued; and it would catch them in the hands of the cowkeeper and butcher. At the present time the butcher and the cowkeeper have to pay or be fined for all the tuberculosis which is put into their hands by the breeder and feeder. The cowkeeper keeps an animal about a year, but the butcher keeps it two or three days. The breeder and feeder supply him with a diseased animal, and laugh at him if he objects.

Insurance companies have been tried, but it is a curious insurance where the butcher has to pay all the money and the other man pays nothing. Even then, I believe, in most cases it has been a complete failure. This subject of compensation is too ticklish a one, and I do not intend to go into that just now. I am always getting into trouble and being told that a veterinary surgeon has nothing to do with compensation. I think he has, when it is part and parcel of the arrangement that he makes. My time is up, and I would simply conclude by saying that every other country has some legislation against tuberculosis, but we, in our insular ignorance, have none. (Cheers.)

Dr. CHARLES PORTER: Before venturing suggestions as to legislative changes it is necessary to consider what legal provisions already exist for these purposes. They are:—

1. The Dairies, Cowsheds, and Milkshops Orders, 1885 and 1886.
2. The Contagious Diseases (Animals) Act, 1886, *Sec.* 9 (4) *and* (6).
3. The Infectious Diseases (Prevention) Act, 1890, *Sec.* (4).
4. The Regulations made under the above Orders.
5. The Tuberculosis Clauses of certain local Acts.

The Dairies, Cowsheds, and Milkshops Order of 1885 (for offences against which the Order of 1886 provides penalties) is made under the Contagious Diseases (Animals) Act, 1878, *Sec.* 34, and (briefly) provides for the registration, sanitary construction and maintenance of dairies and cowsheds, and the making of regulations for their good ordering, and for the inspection of cattle (Art. xiii. (a)). It also prohibits the use of milk from a diseased cow "for food of swine or other animals unless and until it has been boiled" (Art. xv. (c)). But the Order generally only applies to the diseases scheduled under the Contagious Diseases (Animals) Acts, of which tuberculosis is not one; and though the Dairies, &c., Order of 1899 extends the 1885 Order so as to prohibit the mixing of tubercular milk with other milk, and its sale or use for human food, it does not apply at all to the regulations for inspection of cattle in dairies, or the use of unboiled tubercular milk as food for other animals. Thus, at the outset, one is met with the *astonishing fact that a sanitary authority has no power to make regulations for the inspection of tubercular cattle in dairies, and no power to prohibit the feeding of animals on tuberculous milk,* although we know that swine are specially susceptible to tuberculosis, and that the great majority of calves that become infected are infected through the milk of tuberculous mothers (Report Royal Com. 1898, par. 14 and 50).

Surely the Dairies, &c., Order of 1899 was unintentionally limited in its application.

The Contagious Diseases (Animals) Act, 1886, *Sec.* 94, gives a local authority's officers right of entry on premises within the authority's district for the purposes of the Dairies, &c., Orders. But as the Act does not apply to tuberculosis, *the second surprising fact appears, viz., that the officers of a sanitary authority have no legal right of entry into any cowshed in reference to tuberculosis in the cattle therein.*

Outside its own district a sanitary authority has apparently no power to inspect milch cows, either in regard to tuberculosis or any other disease, even though the owner of the cows is registered in its district as a milk-seller and sells such cows' milk therein. The benefit of registration is thus largely lost, as an enlightened district may be left at the mercy of an apathetic one. Clearly, therefore, statutory powers are required for the inspection of milch cows, in regard to tuberculosis or any other disease, by the officers of any authority within whose district milk from the cows in question is supplied.

The 1886 Act also makes the rural and urban sanitary authorities the local authority in their districts, in place of the previous "county authority," viz., the Justices in Quarter Sessions, of whom, in administrative matters, the County Councils are the successors.

It thus comes about that, although the *County Councils* are still the local authority under the Contagious Diseases (Animals) Act, they *have absolutely no powers in regard to dairies and cowsheds, nor in reference to tuberculosis*, because it is not scheduled under that Act. Consequently, the Shropshire County Council, when recently invited to take action in obtaining concerted veterinary inspection of milch cows, and in providing facilities for tuberculin testing, found itself absolutely powerless to do or spend anything for this purpose.

County Councils should certainly receive statutory powers in the directions indicated, and, as in regard to rivers pollution prevention, analysis of food and drugs, and housing of the working classes, they should possess, in respect of dairies, cowsheds and milkshops, direct executive functions concurrent with those of the local sanitary authorities.

The Infectious Diseases (Prevention) Act, 1890, *Sec.* 4, gives the medical officer of health powers of inspection of dairies *in his district* and of the animals therein, if there is evidence that any person is suffering from disease attributable to the milk therefrom. Similar inspection of *outside dairies* may be made on a Justice's order.

This measure primarily protects the consumer, but, secondarily, tends to improve the condition of cowsheds and cows. Unfortunately, however, the word "disease" is limited here to "notifiable infectious disease," which does not include tuberculosis.

The latest Regulations under the Dairies, &c., Order, dated March, 1899, when tested by the Royal Commission's structural recommendations as to cowsheds, are apparently satisfactory, though other codes—*e.g.*, that of Manchester—are much more explicit and detailed. In regard, however, to cubic space requirements, the Model Code does not meet with unqualified approval on all sides. It divides cowsheds into two classes. The first consists of those "the cows from which are habitually grazed on grass land during the greater part of the year, and, when not so grazed, are habitually turned out during a portion of each day"; for these, which may be described as "country cowsheds," nothing whatever is specified about cubic space. For the second class, which includes all other cowsheds, and may be termed the "town cowsheds," 800 cubic feet of air space per cow is

suggested as the proper allowance. The omission to specify cubic space requirements in rural districts is presumably a consequence of the Royal Commission's finding that physical circumstances vary so much in different rural localities, that it is not practicable to prescribe a uniform minimum; but this hardly explains the absence from the Model Code of any reference whatever to cubic space, for the Commissioners recommended "such space per cow . . . as would . . . secure reasonable ventilation without draught." This is an unfortunate difficulty in the Regulations, for it has been truly said that "by far the worst constructed, worst ventilated, and the dirtiest cowsheds are to be found in villages, hamlets and rural areas." Moreover, as pointed out by Dr. Niven, milch cows in towns are mostly young, are kept for one year only, and are then slaughtered, whereas milch cows in the country are, for breeding purposes, kept very much longer, often under much less favourable cowshed conditions, have a longer time in which to develop tubercle, and, as a matter of fact, suffer from it more frequently, as Manchester and Liverpool statistics have very clearly shown, the actual proportions of infected town and country milks being 13·4 to 5·2.

With regard to the objectionable practice of placing cows with their nostrils close to the wall, and thus minimising their chance of breathing fresh and moving air, no regulation exists, and there would not appear to be any statutory power to frame one, unless (which seems doubtful) it could come under the heading of "regulating ventilation." Mr. John Speirs, one of the Royal Commissioners, himself found that the air at the head of such stalls was usually more polluted than elsewhere, and it is precisely at this point that a sufficiency of moving air should be provided if infection from cow to cow is to be prevented. This may be effected by having a 4 ft. passage or fodder-arm at the heads of the cows.

Valuable suggestions as to cowshed construction have been issued in Sheffield by Dr. Harvey Littlejohn, and in Manchester by Dr. Niven, and some memoranda issued in Stockport in 1897 by the writer are appended hereto.

The Tuberculosis Clauses of 1899 (Manchester, Stockport, Derby, etc.) provide for: (1) Notification of actual or suspected tuberculosis of the udder; (2) inspection of milch cows either within or without the district, and sampling of their milk; (3) penalties for selling milk of cows with tuberculous udders, and for failing to isolate such animals; (4) the application, with consent of owners, of the tuberculin test to cows by a veterinary surgeon.

These powers have been used considerably in Manchester and Derby.

Dr. Howarth (Derby) thinks that other restrictions are very necessary, because suspicious cows are removed immediately after a sample has been taken, and the tendency is to create an objectionable trade in cows with doubtful udders.

Dr. Niven (Manchester) considers the clauses undoubtedly valuable, and that they have brought about the removal of over forty cows with tuberculous udders from dairies supplying milk to Manchester. Like Dr. Howarth, however, he points out that there is nothing to prevent the sale of a milch cow, which the owner knows to be tuberculous, to some other party who may

continue to use it for milk-producing purposes. This difficulty appears obvious, and the writer thinks it can only be met by measures such as some of those applicable under the Contagious Diseases (Animals) Acts to pleuro-pneumonia, swine-fever, etc., viz., declaration by local authority of "infected places," out of which the infected animals must not be moved, together with power to test with tuberculin, and, if reaction follows, to slaughter.

This power to slaughter is recommended by the Royal Commission, 1896, and at once raises the vexed question of compensation. The Commissioners think that if, post-mortem, the slaughtered milch-cow were found to be free from tuberculosis, the owner should be paid its full value, but if tuberculose, then only the proceeds of the sale of the carcase. As it is impossible to detect localised tuberculosis in the living animal from its outward appearance, and as there may possibly be no outward sign of even generalised tuberculosis, the latter proposal would often involve great loss and hardship on the owner. Whilst, therefore, no compensation should be given for a carcase with general tuberculosis, one ventures to think that, for a limited period after the public provision of facilities for tuberculin testing, a *via media* should be taken in regard to an owner of a milch-cow with *localised* tuberculosis, who can prove that within a reasonable time of slaughter he gave a fair price for the animal and that he could not then have reasonably known or suspected that the animal was tuberculous.

According to MacFadyean (Min. Evid. Royal Com., 1896, par. 1256), "It is exceedingly rare for a cow to be attacked with tuberculosis in the udder first; it is also rare to get a cow that has tuberculosis of the udder and only slight tuberculosis elsewhere. Tuberculosis of the udder is usually found in advanced cases of tuberculosis. Even if all cases of tuberculosis in cattle were allowed to die . . . only a small precentage of them would ever get tuberculosis of the udder." If this be true, no compensation would be necessary in regard to most cows with tuberculous udders, as they would be suffering from generalised tuberculosis.

It is said that compulsory slaughter and compensation have been a costly failure in Belgium and elsewhere, *e.g.*, Massachusetts, but it is not clear whether Belgian procedure was controlled by the tuberculin test, and even if it were, improved technique has given it a present value it did not then possess. And though the Royal Commissioners condemned as impracticable for tuberculosis the methods under the Contagious Diseases (Animals) Act by which pleuro-pneumonia has been stamped out, they nevertheless recommended compulsory (par. 43) slaughter. If to this be added the very necessary and reasonable powers of prohibiting the removal of suspected animals and the endowment of County Councils with executive powers, something closely resembling the machinery of the Contagious Diseases (Animals) Act *without compensation* is evolved. But, until this compensation question is settled, the powerful agricultural and meat trade interests of the kingdom are, the writer is convinced, strong enough to block any proposed legislation for dealing effectively with bovine tuberculosis.

Elimination of Tuberculosis from Herds by means of Tuberculin Testing.—The successful experience of Denmark led the Royal Commission to recommend that the Board of Agriculture be empowered to provide gratuitous testing of stock whose owners will undertake to keep them under satisfactory conditions and to isolate reacting animals. If, in addition, the calves of tuberculous mothers be fed on boiled milk, if healthy animals be retested once or twice a year, and if purchased animals be only beasts which have withstood this tuberculin test, Professor Bang believes that a markedly affected herd may be replaced by a healthy one. The writer ventures to think County Councils and County Borough Councils, who already have to provide a veterinary staff for the purposes of the Contagious Diseases (Animals) Act, might, with advantage in suitable cases, have the power of providing gratuitous tuberculin tests delegated to them by the Board of Agriculture.

Official registration and the branding of cattle which have withstood the test have been suggested, but branding, at any rate, is open to the objection that tuberculosis may develop after the performance of the test, whereas the brand would be apt to be regarded as a permanent hall-mark of soundness.

Dr. Meredith Young has called attention to the fraudulent use of tuberculin for "fortifying" tuberculous animals against a subsequent application of the test. This, of course, ought to be penalised. He has also suggested that imported animals should not be landed in this country until they have first passed the tuberculin test. But are not, practically, all these animals immediately slaughtered, and their carcases inspected, at Birkenhead or Deptford?

Protection of Inspecting Officers.—In any legislation for dealing with tuberculosis, it is most essential that a clause should be inserted similar to sect. 265, Public Health Act, 1875, for the protection of all medical, veterinary or other sanitary officers, from personal liability in respect of anything done *bonâ fide* for the purposes of such legislation.

To summarise briefly:—

I.—General legislation is urgently necessary for the following purposes:—

1. Inasmuch as no such powers already exist in reference to tuberculosis to empower urban and rural sanitary authorities to inspect, in regard to tuberculosis and any other disease, cows and cowsheds, wherever situated, from which milk is supplied to their districts.

2. To endow County Councils with concurrent powers.

3. To amend and extend the provisions of the Dairies, &c., Order of 1885 so as (1) to make applicable to tuberculosis its regulations concerning the inspection of cattle; (2) to prohibit the use of milk from tuberculous udders as food for animals unless first boiled; (3) to provide for a sufficiency of moving air at the heads of milch cows kept in cowsheds.

4. To empower the Board of Agriculture to provide, on specified conditions, for free tuberculin testing of the stock of all assenting owners, and to delegate, where desirable, the administrative details to County Councils and County Borough Councils.

5. The application to the kingdom generally of powers on the lines of

the Tuberculosis Clauses of various local Acts, with the further powers of prohibiting the removal of suspected animals and of applying the tuberculin test.

6. The compulsory slaughter of all reacting animals, as it is impossible, except by an almost impracticable system of espionage, to ensure their isolation and the disuse of their milk.

7. The payment of full compensation when the slaughtered animal is found to be free from tuberculosis, and of substantial partial compensation when the disease is localised, but only in such cases.

8. Penalising the fraudulent use of tuberculin for "fortifying" purposes.

9. Protecting from personal liability sanitary officers acting *bonâ fide*, as per sect. 265 of Public Health Act, 1875.

II.—Administrative changes as implied by the legislative proposals just enumerated, and in addition—

1. Reference in the Model Regulations to some cubic space requirements for cowsheds in sparsely populated localities.

2. Periodical veterinary inspection of milch cattle.

3. Dissemination amongst farmers and cow-keepers of information in regard to bovine tuberculosis, and especially in reference to the value of the tuberculin test and the importance of feeding calves on wholesome milk.

COUNTY BOROUGH OF STOCKPORT.

MEMORANDA *RE* COWSHED INSPECTION, ETC.

Effectual lighting: 3 sq. ft. window-space per cow required in Sheffield.
Adequate ventilation:—

(*a*) *Inlets:* louvred openings, or windows falling in at the top, in walls at two opposite sides of the building.

(*b*) *Outlets:* extraction shafts in centre of roof, or, if one wall be without window or other opening, extraction shaft to be as near thereto as possible.

Adequacy may be tested

(*a*) By absence of oppressive smell when cows all housed.

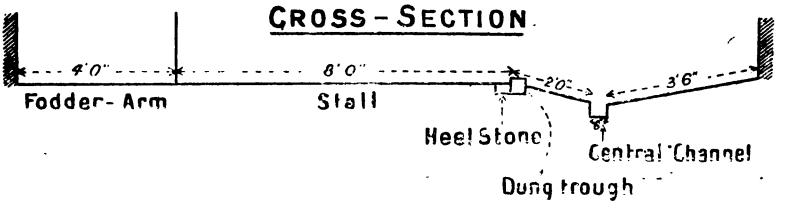
(*b*) Estimation of CO_2 in air of cowshed.

800 cub. ft. free air space should be allowed per cow.

Floors of (1) concrete floated over with cement; (2) asphalt; (3) flags with cemented joints.

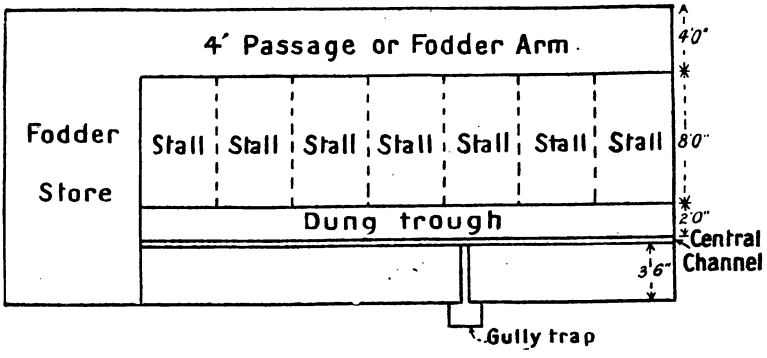
Should fall to central channel leading to opening, outside cowshed, of trapped drains.

Width not less than 14 ft., and, if possible, 18 ft. (for fodder-arm), thus—



Fodder-arm = 4 ft. Stall = 8 ft. Dung-trough = 2 ft., with fall of 3 ins.
Central channel = 6 ins. Passage at back = 3 ft. 6 ins.

GROUND-PLAN.



N.B.—Each cow should have a separate stall if possible.

N.B.—Each stall should have a separate stoneware manger trough.

Note.—In Sheffield that portion of each stall between the manger and the heelstone is allowed to be made of clay, as some cowkeepers insisted that if all flags or concrete cows would suffer from inflammation of knees.

Walls to height of 7 ft. to be lined with impervious and easily cleansed material, *e.g.*, Portland cement.

Ceiling to be tongued and grooved if forming floor of hayloft, but in new buildings no loft should be allowed over cowshed.

Water Supply.—Bye-laws require adequate supply of good water cisterns to be of slate or metal and conveniently placed. In new cowsheds, service-pipe should convey water along head of stalls, with movable branch-pipe to each trough.

Manure-midden should not communicate directly with cowshed.

Mr. A. Armitage, of Nottingham, said: I rise as a butcher from Nottingham and also as a farmer. I am the Vice-President of the National Federation and President of the Nottingham Butchers' Association. There have been words spoken here this morning with regard to 30 or 40 per cent. of cattle having tuberculosis. I had the misfortune about ten years since to buy two Alderney heifers, and they went to my farm in March. In June they were followed by the Government inspector, and one was supposed to have had pleuro-pneumonia and recovered. They came to my place and slew right and left. I had about seven or eight milch-cows, a lot of young beasts, and a lot of stores. I told them when they first came that if a shorthorn cow in the herd had pleuro-pneumonia I did not know anything that had not. It was what we used to call in those days "grapes." This cow was killed—a very fine cow, weighing very nearly one thousand pounds, and as good as it was possible for a cow to be. More than forty beasts were killed at my place, and there was not one trace of tuberculosis discovered. I kill a lot of beasts, about ten or twelve a week, and I have a young man who has been with me for nearly ten years, and he has never seen a tuberculous beast until last year, when I had the misfortune to have one, and he has

never seen one since. (Laughter.) He is now my partner. (Laughter.) With regard to the statement of Professor Koch, I think in the long run he will be proved to be right. (Laughter.)

Mr. POTTIE, of Paisley, remarked: In Mr. McEachran's paper there is something which is very good, and if you will look at the first page you will see that good part:—"Our efforts must be to educate the people so that they themselves will voluntarily adopt our suggestions." Now I want to know what is the education that we are to give? Are we to give them the education of Professor McEachran, or are we to give them the education of Professor Koch? What is the education of Professor McEachran? He says it is communicable from animals to man, and from man to the lower animals by natural infection and inoculation. He says it is, not "may be." We heard the other day that we are to put it as a "may be," but now Professor McEachran makes a positive statement. Is he warranted in making that statement in face of the highest authority on the subject, a man who is the father of the tuberculosis question? Men who are mere students compared to him come forward and say they reject his teaching, and will teach something else to the public. That is a dangerous thing in science. Science is rigid facts, not "may be's." Our profession and other professions have gone in advance of science, and a man who goes one inch in advance of science retards science; and you have retarded science. We have heard from this platform that the whole of the veterinary surgeons are of this mind. There was a lecture delivered in Carlisle a year ago containing the very same ideas that Professor Koch has put forward, and when that lecture was delivered one member of the profession left the meeting because he said the ideas were so extraordinarily in opposition to his.

A DELEGATE: Who was the author who anticipated Koch?

Mr. POTTIE continued: I want to know what education we are to give them? Do you think for a moment that if there is such a distinct difference between men in the profession on this subject we should adopt any legislation? It has cost £10,000 and more already with the various investigations, and that is not a small sum. What was the result? They "inferred"; they never proved. You never found an astronomer saying that he inferred the earth went round the sun. Why? Because it is a fact.

The CHAIRMAN, interposing, said: I really must ask you to stick to the subject.

Mr. POTTIE: I know perfectly well what I am about. I knew perfectly well it would come to this. (Cries of "Chair, chair.")

The CHAIRMAN said: I really must ask you to desist.

Mr. POTTIE said: I thought so.

Mr. F. J. LLOYD, British Dairy Farmers' Association, here spoke as follows: I have attended this Congress as a scientific man, having no special interest to serve except that I happen to be chemist and bacteriologist to the British Dairy Farmers' Association; but I do not for one moment associate myself with the views which may be held by the dairy farmers. As a scientific man I have listened with surprise to the extreme views which have been put forward by many speakers at this Congress; and they have reminded me of the old debate which, when I was a boy, excited the interest of the scientific world, the question of spontaneous generation. I cannot help remembering how the whole world was then opposed to one great scientific man who at the present day is believed in by every living person. I think perhaps we may in years to come look back to the time when we held erroneous views equally strongly, such as those which have been put forward here. For instance, Professor Nocard has said that the milk used for cheese-making should be sterilised, apparently not knowing that it is absolutely impossible to make cheese from sterilised milk, and that his objection would destroy every atom of cheese made. That is an extreme view from a man whom I respect as much as any man for the work he has done, but only showing how difficult it is for us to limit ourselves to what we know, and not go to things that we know not of. Even supposing it was possible to sterilise the milk for the manufacture of cheese, my friend Professor Harrison, of Geneva, U.S.A., and Professor Freudenreich, of Berne, have made cheese with milk into which the tubercle bacillus has been put, and they have found that before that cheese is fit to be consumed not a single tubercle bacillus is in existence. So much for the necessity of sterilising milk which is used for the manufacture of cheese. Professor Bang, I am sure, will agree with me when I say that the Danes introduced the system of pasteurisation, not for the sake of destroying the tubercle bacillus, but in order to obtain butter of uniform and better quality for the English market; and he himself has shown that it was not the butter that was dangerous, but the separated milk, and more especially the slime in the separator; and if we want to legislate to prevent the spread of tuberculosis, that is the material we should endeavour to have destroyed. With regard to milk, I have been surprised at this Congress not to hear one single word about the other diseases which milk is said to propagate. Small-pox, typhoid fever, and other diseases are put down to milk as much as tuberculosis, and with far more powerful evidence in support of the fact that milk has been the cause of those diseases. ("No.")

A DELEGATE said: It is not germane to the subject.

Mr. F. J. LLOYD replied: It is germane to the subject, because I say we are here to teach the public, and if we stated that milk was a source of tuberculosis, and we know it has been the source of other diseases, surely our duty is to tell the public to sterilise or pasteurise that milk, not merely for tuberculosis, but for other diseases. Let us take steps to get rid of tuberculosis, and at the same time we get rid of the danger of other diseases. I think it is an

easier thing to teach the public to safeguard themselves than to attempt to get rid of tuberculosis in this country by too stringent measures. I feel certain that the medical profession will agree with me when I say that in the towns where the great difficulty is to get rid of tuberculosis, quite as much difficulty arises from the want of sanitation as arises from the milk. And therefore it is our duty to teach the public to destroy the power of the milk to be dangerous. I believe myself that every step should be taken to prevent the spread, and to entirely eradicate this disease from the herds of the country, not because of the danger to the public, but because it is absolutely an unprofitable and destructive disease to the farmer; and if the veterinary profession had been only unanimous in the past, and with one voice always spoken the same thing, there would not have been the difficulty we have at the present day in educating the farmer to realise that it is his duty to get rid of this disease. The simplest way to do it is not to take drastic measures, but to take reasonably sensible measures. First of all there should be separation of the animals that are diseased from those that are not diseased, and then we shall not, as one speaker said, have tubercle bacilli by millions disseminated from both ends of wasters. We can and we ought to have legislative measures to eradicate tuberculosis; but if you attempt to get the measures which some of you have asked for, you will have the Legislature and the public opposed to you, and instead of doing the good you want to do, and which I most heartily hope you may do, you will, by going to extremes, spoil the end you have in view.

Mr. J. S. Lloyd, of Sheffield, said: It is not my intention to take up your time more than for a very few minutes, but there are one or two points which it has struck me I might give a little information about. Mr. Duthie has spoken on the matter of ventilation, outdoor exercise, and warmth for cattle. I believe, if I am correct in my assumption, he is a great breeder of pedigree shorthorns, and not a keeper of dairy cattle. With cows that are kept for supplying milk, the greatest difficulty I, as a veterinary inspector, meet with is to get the cow-keepers to ventilate their byres; in fact, they will not do it. If the local authority compels them to put ventilators in, they stop them with hay, or racks, or anything that comes handy. A great deal depends on how the ventilation is carried out; it is a thing that certainly requires doing in a proper manner. During the eighteen or nineteen months I was veterinary inspector for Manchester my duty was to a large extent inspecting cows, and during that time I came across fifty-two cows with tuberculous udders. Out of those fifty-two cows twenty-six had been slaughtered, and the other twenty-six have not been slaughtered, because there was no power to compel the owners to do so, and persuasion was of no avail. Out of those twenty-six cows not slaughtered only eight are known to the authorities in Manchester; the other eighteen have been spread throughout the length and breadth of the land, and no definite evidence with regard to them is known. Under section 116 of the Public Health Act, inspection of meat is confined to medical officers of health and inspectors of nuisances. With all deference to inspectors of nuisances and

sanitary inspectors, they are not trained, or up to very recently have not been trained, in inspection of meat. (Hear, hear.) I contend that the inspection of meat should be carried out by men who understand it. It would take away a great deal of the animus of the Meat Traders' Association to know that the inspection of meat was carried out by such men. (Hear, hear.) They would not, I think, have much cause to ask for compensation. On one question I entirely disagree with the Meat Traders' Federation, and that is where they join issue with the agriculturists in asking for compensation for tuberculous udders. Their previous standpoint was that they should only ask for compensation for the carcases of cattle seized after slaughter where there was no evidence of the disease before death. If a cow has a tuberculous udder before she is slaughtered, how can you say there is no visible sign of disease? In the last Royal Commission on tuberculosis the matter of compensation for tuberculous udders was dealt with, and the recommendation was made that the cows should be slaughtered, and if the udder was found after death not to be diseased, full compensation should be paid for the animal; and if the animal was found to have a diseased udder, then if the carcase was fit for food the owner should have the value of the carcase, whatever it was, and if it was unfit for food no compensation should be paid. With that I entirely agree. A good deal has been said about compulsory notification of diseased cattle. Under the Manchester milk clauses this compulsory notification has become part of the law, as far as dairymen supplying milk to Manchester are concerned. During the year or so they have been in force there have not been six notifications sent to the Medical Officer of Health for Manchester, although there have been fifty-two cows found with tuberculous udders. I am sorry to contradict Dr. Porter, because he is a barrister and should know more about the matter than myself; but he said a veterinary surgeon has no authority to go into a shed for the inspection of cows. In a circular letter sent out by the Local Government Board in March, 1899, the words run something as follows: "That a local authority may employ a veterinary inspector to carry out these duties if they think fit so to do." If they have no power to do it, I do not see why that letter should be sent out.

Dr. PORTER: May I answer that point, because that is a thing which has engaged my attention. I assert, and I am confident I cannot be contradicted, that that procedure, as recommended by the Local Government Board, is absolutely *ultra vires*, looked at from a strictly legal point of view.

The CHAIRMAN (Sir George Brown), interposing, said: We cannot possibly go into that; it is a charge against the local authority.

Dr. PORTER: Might I say one word more?

The CHAIRMAN: No. I beg you to sit down.

Mr. MORGAN: May I ask if it is the intention to move a resolution at this meeting?

The CHAIRMAN: No.

Mr. MORGAN: Any resolution at this meeting?

The CHAIRMAN: No. I have told you that any resolution you give me I will submit, as I have already done with the only one I have, to the Committee that will have to decide. This meeting will not have to decide. No resolution passed here, or in any of the sections, will go before the General Meeting without being thoroughly criticised, cut down, and dealt with as the Committee thinks fit.

Another DELEGATE: Will this resolution be allowed to be put to the meeting this afternoon. I mean the one by Mr. Bowen-Jones, of which copies have been distributed?

The CHAIRMAN: Do you mean before the General Meeting?

The DELEGATE: Yes.

The CHAIRMAN: There is nothing to prevent any member of the Congress proposing at the General Meeting any resolution he likes. You will be perfectly free there, and that is why I say it is not worth while to attempt to pass it here.

A DELEGATE: Between half-past one to-day and three o'clock, will a Committee of the sections meet for the slaughter of the innocents?

The CHAIRMAN: Yes.

The DELEGATE: They have not met, and we do not know whether Mr. Bowen-Jones' motion will be slaughtered or not?

The CHAIRMAN: They had one long meeting last night, but could not finish the work, and are going to meet again to-day at half-past one, the object being to decide what resolutions are to be put to the General Meeting, and in what form. Anyone taking a resolution is perfectly competent to propose it.

Mr. MORGAN: Would it be competent for this meeting to depute Mr. Bowen-Jones and Mr. Cooper to attend this meeting this afternoon, in order to voice the opinion of this meeting?

Professor W. OWEN WILLIAMS: It seems, Sir, that this is not a veterinary meeting, but a trade meeting.

Mr. MORGAN: It is a public meeting, not a trade meeting.

The CHAIRMAN: I do not mind its being a trade meeting at all.

Mr. BOWEN-JONES: Might I ask that you will lay before the Committee which selects and decides what resolutions are to be put before the general body this afternoon these resolutions, and impress that body with the fact that the suggestions I made yesterday were unanimously accepted by this Section. ("No.")

The CHAIRMAN: I can assure you, Mr. Bowen-Jones, that when I handed in the resolution those were exactly the words I used.

Mr. BOWEN-JONES: That assurance is all I can wish for.

The CHAIRMAN: I should like to ask whether there is any gentleman who objects to Mr. Bowen-Jones' resolutions?

A DELEGATE: Certainly, Sir, I do.

The CHAIRMAN: Anyone else? Well, there is only one objection, and I will mention it to the Committee.

Mr. ANDERSON: I rise to a point of order. I do not think any person ought to be asked to be put in the invidious position of rising to make an objection to the motion. There are other gentlemen here who have not the courage to do that. ("Order, order.")

The CHAIRMAN: Allow me to say that you and those gentlemen can be at the General Meeting and make any proposition you like.

Prof. MCEACHRAN, in reply, said: I thank you for the manner in which you have received my Paper. With reference to my suggestion that hides, hoofs, horns, and hair should be allowed to be sold from tuberculous animals, if I understand the commercial manner in which hides and horns are dealt with, they are put into tanning vats and through other processes, and finally the hair is used very largely for plastering. I am not aware, as stated by Professor Edgar, that these things are put on the land as manure. The tubercle bacillus differs from the bacillus of anthrax very materially in not being so active. The anthrax bacillus, being a spore-bearer, is almost indestructible and most dangerous, but the tubercle bacillus is not known to be a spore-bearer, and besides it is not so virulent, and much more easily killed by sunlight and exposure to air. So that there is no comparison between these, and I still maintain the horns, hoofs, hide, and hair should be allowed to be sold, and that there would be no danger. I think if Professor Edgar was asked the question of whether he had known an instance of hair being the medium of communicating the disease, he would tell us he had not. With reference to the remarks made as to communication, I still adhere to the communicability of this disease from animals to man. Yesterday Professor Crookshank gave details of one case of direct inoculation of cows with tuberculosis from human sputa, and Dr. M. P. Ravenel, of Philadelphia,

related three instances. I was in Winnipeg the other day, and was told by the medical officer of health of a case where a farmer from the eastern parts of Canada had settled on the prairie so far away from another settlement that there was even no school or church. There was no possibility of contracting the disease, and when the family went there they were perfectly healthy. After a time the two children, who were fed very largely on milk, began to sicken. They gradually got worse, both of them ultimately dying from tuberculosis. The parents remained healthy. They had not taken much milk. When the examination of the cattle was made they were found to be suffering from advanced stages of tuberculosis. In my last Report the following remarks occur:—"The following Report recently received from one of the district inspectors illustrates the relationship between human and bovine consumption." He says, in reporting the testing of a herd in which a diseased animal was found—"the cow marked 'diseased' is not the property of the owner of the herd, but belongs to a widow who sent her to be wintered to the farm of the owner of the herd, all of which, except this cow, are healthy, having given no reaction to the test. This woman's husband died of consumption last spring; she also lost a child from tuberculosis, and shortly after her husband's death her dog showed symptoms of tuberculosis, and on destroying him I found him similarly affected." When such cases as these come constantly before one we must think there is communication. I admit that is not positive proof, but it is practical, and we cannot at the present stage, even in the face of Professor Koch's announcement, rid our minds of what I have put in my Paper. I certainly cannot until I have further proof. Directly it is proved satisfactorily I shall be one of the first to withdraw the remark. The Paper was written a couple of months ago, and I was not aware of the change that was to take place.

The CHAIRMAN, in concluding the meetings of the Section, said: Before we separate I should like to take the opportunity of expressing my great satisfaction at the very large and enthusiastic audiences which this section has attracted. I had no idea in the first instance that we should get anything like such gatherings, and I hold it to be a mark of the interest which the agriculturists and the tradesmen are taking in this matter; and I hail with something like delight the assertions that have been made over and over again that the trader, the meat salesman, as well as the farmer, are quite convinced of the great importance of taking every possible precaution for the purpose of getting rid of the disease in the lower animals. I have already told you that I sympathise with them in the injustice to which they occasionally have to submit in the seizure of carcases of animals which are suffering only from localised tuberculosis; and as a member of the two Commissions I did the best I possibly could. In the first Commission I wrote a separate Report, signed by myself, to call attention to the fact that these injustices were being perpetrated, and four or five years later I did the same thing on the second Commission, and in the recommendations of that Commission it is as distinctly stated as it is possible for the English language to state anything,

that a large quantity of useful meat is sacrificed to the incompetency of the men engaged in the inspection. If there is no scheme formed as the result of our recommendations I call on you to witness that it is not our fault. We had no powers beyond the powers to suggest what ought to be done, and leave it to the public to see that as soon as possible something should be done.

Mr. St. John Ackers proposed: Before this meeting concludes I am sure it will be the wish of everybody here and of those who have not been able to stay, to give a very hearty vote of thanks to our excellent Chairman, Sir George Brown. (Cheers.)

Mr. Bowen-Jones seconded the resolution, which was carried unanimously.

The meetings of the Section then terminated.

The following paper on "Tuberculin Testing, especially referring to the Argentine Republic," was presented by Mr. Harold Sessions, F.R.C.V.S., F.H.A.S.:—

In the present state of our knowledge it must be allowed that tuberculosis is a disease of a contagious nature—a virulent death-dealing disease that can pass from one animal to another, and from one species to another. The power of resistance to the disease varies in different species of animals, and even in different families or individuals of the same species. Allowing for these variations the fact remains that we have this death-dealing disease, terrible in its ravages, and we are met here to-day to ask ourselves and each other what means are the most effectual that we can direct towards lessening these ravages? The total eradication of the disease we may safely leave to the care of some future Conference.

Apart from human beings, the animal in which tuberculosis chiefly shows itself is the cow. The two are so intimately connected in civilised life that it is natural that a good deal of danger is apprehended that the disease may pass either through the milk or flesh of an affected cow to a human being, or from a tuberculous human being to a cow. But quite apart from any danger to human beings, I have long held and advanced the view that the ravages of tuberculosis among our domestic animals are so great that for that cause alone we are fully warranted in taking all needful measures for its curtailment now, because we can get rid of it in the domestic animals long before we can do so among human beings.

After the first recognition of the disease some years ago, the trouble that we had to contend with was to get an approximately correct diagnosis; and I think I may say, without fear of contradiction, that, except in advanced cases, we could not with any certainty diagnose 5 per cent. of affected animals. With the discovery of tuberculin a fresh stage was marked in the diagnosis of the disease. We soon found that we had an agent which had a marked effect on animals affected with the disease, and the next few years were

devoted to brilliant anticipation, study, and rash assertions of the power of tuberculin. I wish to take this opportunity to remind and to emphasise the fact to some of the critics of the power of tuberculin that during those years many of us worked, not, as some people seem to think, to find out cases in favour of tuberculin, but to find out whether we could obtain any reliable results from its use, and what those results were likely to be. Using some of the first tuberculin obtainable on cattle of my own, the results appeared to be far from satisfactory. It was only after a prolonged and careful working under a variety of conditions that I became an advocate for its use.

I do not propose to deal with tuberculin from a laboratory point of view, because there are others better able to do so than I; and having been on the Army Remount Commissions during the last twelve months in Spain and South America, I have not had the facilities needful to keep in touch with the advance recently made. I have been able to see and to hear a good deal as to the value of tuberculin from a practical and commercial point of view. The proposition which I put forward is, concisely, "It is expedient to use tuberculin for diagnostic purposes in cattle." At one time there appeared in the Press a number of loose statements as to the incorrect results given, and the contradictory results obtained by using tuberculin. Some of the statements I took the trouble to follow up, and invariably found that they were neither exact nor correct. They may have arisen—(1) from a tuberculin being used that was old or inefficacious; (2) from the test being hurriedly or improperly performed; (3) from errors at the post-mortem examination; and (4) from the inability of the operator to understand what he sees.

1. *Old or inefficient tuberculin.*—Some few years ago I suggested that tuberculin was much too dangerous an article to be sold, except under strict supervision, and that the whole community would benefit by such supervision. A central authority alone should issue tuberculin; and though they might and probably would license several competent people to make it, all that is made should pass through their hands for issue. They should demand that with all tuberculin sent out within a month a report of how and where it was used should be sent to them, and as far as possible the results obtained with official temperature charts filled up. This would lessen the risk of the indiscriminate use of tuberculin, and the chance of one animal being retested within a week or so. It would also form a basis for much-needed statistics. I consider this a most important point, and shall bring forward a motion to that effect later.

2. *Hurried or improper performance of the test.*—Few people seem to realise how very delicate a physiological reaction the test is, and that only when an animal is in a perfectly normal condition can the test be applied. That in the case of cattle, even bringing them in from a field to tie them up in a shed when they are not regularly tied up, is enough to upset them for two or three days to such an extent that you may not be able to test them. It is quite natural that those who have animals which they want tested should desire to have them tested as quickly, cheaply, and with as little trouble as possible; and those who test animals have continually to fight against these

influences. Otherwise the test results, being incorrect, will bring on the tuberculin test a discredit that is not properly its own.

3. *Errors at the post-mortem examination.*—To make a post-mortem examination requires much time and skill, and simply cutting open an animal and looking at the larger organs cannot be regarded as a post-mortem examination. When after a reaction of tuberculin an animal is killed and no visible lesions are found, before believing that the test is wrong, I always ask myself whether the post-mortem report is not quite as likely to be incorrect. I would even go a step further. It seems to me that a tuberculin reaction may be obtained when an animal is in the very early stages of tuberculosis and before there are definite marked lesions in the tissues. I should consider this to be very probably the case when animals from an inspected herd react to the tuberculin test, and on slaughter show no post-mortem symptoms of the disease. In animals bred on a farm on which tuberculosis does not exist, and, as far as can be ascertained, there is no probability of the animals being affected, a reaction with negative post-mortem results may well be viewed as due to the tuberculin test if the conditions under which the test was applied were accurate —it may reasonably be called an error.

4. *Inability of the operator to interpret the facts.*—Several times I have met with cases where, after an animal had been tested, and a typical tuberculosis reaction had been obtained, animals have been declared free from disease. On the other hand, cases have occurred where an animal's temperature has risen suddenly during the test, not in a typical manner, and no allowance has been made for an extraneous cause. A system of sending all temperature charts to a central authority and having them reduced to a graphic form would very materially help to eliminate this class of mistake. There is not time in this paper to advance the evidence in favour of correct results obtained by the use of tuberculin; I have already done that in some detail in a small book that, conjointly with Dr. T. M. Legge, I wrote after the publication of the report of the last Parliamentary Commission. I will therefore sum up the evidence in a sentence by saying that there are many thousand instances recorded where tuberculin has given correct results and these in cases where there were no other means of diagnosis. On the other hand, there are advanced some instances—not a very great number—where apparently the tuberculin test has been wrong. Amongst these, some of the cases that have been most prominently brought before the public are those of animals sold in Europe as being free from tuberculosis, but which two or three months afterwards have been tested in the Argentine and found diseased.

I had the opportunity while in the Argentine of talking over this matter both with the Minister of Agriculture, Dr. Garcia Merou, and with the Director of Agriculture, Senor Tidblon; and also I saw some imported animals while being tested, and a necropsy. I was kindly furnished by the Director of Agriculture with a very carefully worked-out series of answers to some questions which I raised as to the progress of the disease in the Argentine and what he considered the best means of checking it. He further

kindly supplied me with copies of charts of temperatures of animals tested, post-mortem results, and in some cases with the certificates that had come from Europe. Between the dates of April 12th, 1898, and Nov. 15th, 1900, 2092 imported animals were tested, out of which 158 animals reacted to the tuberculin test. Of these 158 animals 51 were slaughtered and 107 were reshipped principally to the Republic of Uruguay. They were reshipped, because since April, 1898, no animal is allowed to enter the Argentine until it has been tested by tuberculin under the authority of the Argentine Government and certified as free from tuberculosis. If the animal reacts it has, if left in the docks, to be slaughtered. However, in January, 1900, the Government of Uruguay also established an import sanitary inspection; and as since that date no rejected animals have been re-exported there and only a few are re-exported to Chili and Brazil, almost all those that show any reaction are now slaughtered at the Argentine sanitary stations. Of the 51 animals that were slaughtered 50 proved on post-mortem examination to be diseased, the macroscopical diagnosis being confirmed by microscopical observations and inoculations on guinea-pigs. The one case that was incorrect was that of a bull that had swallowed a four-inch nail, which, perforating the stomach, had formed an abscess, causing septic infection with a rise of temperature. The rise of temperature was not typical, and it was suggested by the veterinary inspector that the animal should be considered doubtful and retested, but it was thought, as it was a suspicious case, that it would be wiser to have it killed. These 2092 animals were nearly all pedigree cattle of value, some selling for several hundreds of pounds. At least 1750 had been tested in Europe before embarkation, and of these a total of over 1600 tests agreed in Europe and the Argentine. There were, on the other hand, over a hundred discrepancies. Can these be satisfactorily accounted for? I feel convinced from what I have seen and the information in my possession that the error in very many of the cases was made in Europe. The animals were tested sometimes in remote country places—sometimes after a railway journey; and doubtless in not a few instances the animal to be exported was the first one that had been tested by the operator, and experience had not taught him the need for great care. Again, it is possible under the present system of free use of tuberculin that a veterinary surgeon may test an animal and finding it to react the owner may at once sell it, and within a week another veterinary surgeon may test the animal for exportation, being quite unaware of the first test. The result and the certificate on which the animal is exported are wrong, because it is well known that you cannot correctly test an animal within some weeks of an injection of tuberculin. Again, it is quite conceivable that an owner may test an animal on his own account—there is nothing to prevent it—and then, not being satisfied with his own work, call within a few days for an expert opinion without admitting the fact that he has already tested the animal. All these and many other circumstances have to be considered by the practical mind before accepting all these discrepancies as being due to the tuberculin.

There is another point, too, that has to be considered. Between the two

tests animals pass through the tropics, and in one or two cases I found while analysing these figures that an animal certified healthy in England had been carried by the same boat, and probably in the same stall, as an animal which the previous voyage had been slaughtered on landing and found diseased. This second animal, on arriving at the Argentine, reacted to tuberculin and a post-mortem examination showed it to be diseased. In view of the very contagious nature of the disease among show animals, new fittings, mangers, etc., should always be used when conveying valuable animals. Besides these 2092 imported animals, the tuberculin test has been officially applied in the Argentine to 52,716 dairy cattle and 21,873 other cattle, and the test is believed to be of practical value.

In passing, it may be interesting to observe that in the province of Buenos Ayres the percentage of animals affected with tuberculosis, as revealed in the slaughter-houses, is 0·476 per cent. on the total of 1899. The percentage increases to 2·32 in the highly-crossed shorthorn cattle killed, and decreases 0·0012 in pure native cattle. Consequently it may be inferred that the number of animals affected increases in proportion to the higher degree of crossing with improved imported stock. During the last five years in the Argentine the slaughter-house returns show an increase of tuberculosis. In 1895 the percentage on the total number of animals slaughtered was 0·281; in 1896, it was 0·467. Considering these figures, and the very strong feeling that the Argentine Government appear to have as to the need of testing all animals before they are allowed to enter the country, I raised the question as to whether, when the re-embarkation of pedigree stock commenced, a *modus vivendi* could not be arrived at to prevent animals, after having reached the Argentine, being thrown on the importers' hands, causing much expense and friction. I am glad to say from the information supplied me that that Government would be quite willing to make suitable arrangements to test animals in England before embarkation, provided our Board of Agriculture would on their part furnish guarantee as to their testing, which they might very well do.

What the Argentine Government object to—and quite rightly, in my opinion—is the loose way in which tuberculin is used in England. The Argentine Government wish to do all that they can to facilitate the importation of English pure-bred stock; at the same time, the statistics which I have quoted show the danger of an increase of tuberculosis in their large and valuable herds; and they are right in doing all they can to check its further inroads. For the good of their country, if tuberculin was correct in only 80 per cent. of cases, it must be of manifest advantage to use it; whereas, from our present information, it can be correct in over 95 per cent. of cases where it is used.

I have no doubt that many of the points which I have touched upon will lend themselves to your criticism, and that in the Press afterwards, perhaps more than at this meeting, instances will be adduced to show that tuberculin is notreliable; but, in anticipating them, may I venture to reply that I have been careful in this Paper to make the claims of tuberculin moderate, and that

I have before writing considered and thought over from a practical and scientific aspect the objections already published, and I believe that under proper control tuberculin is a safe and reliable agent to use, and the only means we have at present for approximately diagnosing tuberculosis in cattle.

In conclusion, I would beg to move that this Congress, believing that tuberculin is an efficacious and reliable diagnostic agent, liable to gross misuse whereby it becomes a public danger, would ask the Minister of Agriculture and the President of the Board of Trade whether it would not be feasible to allow tuberculin to be issued by a central authority only, who should demand from those who use it a statement of the results obtained; the advantages derived being the use of properly prepared standard tuberculin, the compilation of much-needed statistics, the minimising of the danger of the fraudulent or wrong use of tuberculin, and the supervision of the temperature charts.

The following Paper—

TUBERCULOSIS IN THE PROVINCE OF ONTARIO, CANADA,

was presented by C. HEATH SWEETAPPLE, Professor of Veterinary Obstetrics and Cattle Pathology, Ontario Veterinary College, Toronto:—

I have not the effrontery to contribute a Paper on tuberculosis, embracing its etiology, bacteriology, pathology, communicability or its general prevalence, for discussion by this convention, amongst whom are the most profound scientific men of the age, and to whose writings I am indebted for most of my knowledge of the disease. But it has been intimated to me that having been in the active practice of my profession since 1869, and a great part of that time in one of the best cattle-breeding districts in the Province of Ontario, a short account of my own experience with the disease might be of interest.

At the present day all who possess any knowledge of the science of pathology in man and the lower animals recognise the fact that tuberculosis or "consumption"—that fell disease that has been said to "cull its victims from the fairest folds"—is the same in man and in the lower animals, and that the ox tribe is especially liable to the disease; and also that it may be communicated from man to man, from animal to animal, from animal to man, and from man to animal.

The most exaggerated views in relation to it, and the modes advocated to be adopted in dealing with it, with the view of "stamping it out," were a few years ago promulgated by alarmists, and in some parts of America carried out for a time. These views have been considerably modified more recently. But we must be careful not to go to the other extreme and minimise the danger of infection, for that there is danger cannot be denied.

The first case that I have on record was about thirty years ago, being called on to make a post-mortem examination on a pure-bred shorthorn cow that was said to have died from "lung disease" after having been sick for

some length of time. I never saw the animal living. The post-mortem revealed extensive tubercular deposits in all the different stages of development. In the thoracic cavity there was one mass of tubercular matter undergoing calcification, weighing over twelve pounds, also caseous, softened tubercle, and vomicæ in the lungs, and an immense deposit of more recent miliary tubercle on the serous membranes, uniting the parietal and pulmonary pleuræ to a great extent. This was on the farm of one of our most prominent breeders and importers of shorthorn cattle. The disease did not extend over the rest of the cattle on the farm. There was no other case of tuberculosis suspected on the farm for the following fifteen years, and, if there has been since, I am not aware of it.

During a practice of twenty years in the County of Ontario I had not more than half a dozen cases in which the post-mortem examination proved the deaths to be caused by tuberculosis. At that time no special care was thought necessary to prevent the spread of disease by infection or contagion, and there certainly were no evidences of its spread in the herds on those farms.

In the year 1894, also in 1895, Dr. Andrew Smith, F.R.C.V.S., Principal of the Ontario Veterinary College, made investigations in the principal slaughter-houses of Toronto for the Dominion Government relating to the prevalence of tuberculosis in the cattle slaughtered for beef. The viscera of some hundreds of cattle were examined, and no evidences of tuberculosis were discovered in any of them. Many of the examinations were made by myself.

In the year 1896 I was requested to inspect some of the large cattle-feeding establishments in the neighbourhood of Toronto for the City Health Department, in which were some hundreds of cattle of all ages—barren cows, bulls, and steers. Only a physical examination was made. Two bulls were detected with very suspicious symptoms; they were in good condition. These were killed, and marked evidences of tuberculosis were presented in the viscera.

In 1898 I made a post-mortem examination of a horse that had died, owned by one of the large cartage firms in the city of Toronto. There were many other horses in the stables. The animal had been sick two or three months; I did not see him during life. There was an immense deposit of tubercle in the early stages of development (miliary tubercle) upon the serous membranes, particularly upon the serous coats of the liver, lungs, and on the diaphragm. The tissues of the liver and other viscera were not so badly implicated. It was the only case in those stables that I am aware of.

In 1899 I examined a pure-bred Ayrshire cow in the neighbourhood of Toronto. She had been purchased a short time before and a guarantee of soundness had been given with her. She presented very suspicious symptoms when first seen, and her temperature was too high for the application of the tuberculin test to have been reliable. Her lungs were badly affected, and she gradually grew worse, and was ultimately killed. At the post-mortem examination marked evidences of tuberculosis were seen in the lungs and pleuræ, and there was a large mass of tubercular matter undergoing calcification in the liver.

During the last few years I have made a large number of post-mortem examinations for the City Health Department of Toronto. In the past year there have been about 150,000 head of cattle passed through the Toronto Cattle Market. These come from all parts of the country, principally north and west of Toronto. Of these, about three-fourths are fat cattle fit for butchering, the rest stockers, for feeding purposes. They are exceedingly healthy cattle. Any bullock showing any tumour, enlargement, or any other evidence of disease is held, under the authority of the Health Department of the city, to be butchered under veterinary inspection, and the meat either passed as fit for food or condemned.

Of the fat cattle about 20,000 are butchered yearly for consumption in Toronto.

Of the whole number passing through the market during the past year, about 150 have shown tumours, enlargements, or other evidences of disease, and have been held and butchered under veterinary inspection. In ten of these tubercular deposits in the viscera have been found, and about seventy of them have had tumours in the soft tissues in the region of the throat which I believe to be of a tubercular character, but with no evidence of tuberculosis in the viscera. The rest, about seventy, had no evidences of tuberculosis whatever, the post-mortem examinations revealing actinomycosis and other conditions of various kinds that it is not necessary to discuss here.

Just recently, portions of the lungs, liver, and of the diaphragm of a calf two weeks old were forwarded to the Ontario Veterinary College for examination. It was a well-marked case of tuberculosis. In the liver tissue were numerous tubercles; also upon the serous coat of the diaphragm, and a few in the lungs. The tubercles in the liver were caseous, those on the diaphragm were miliary and more recent. The caseous condition of the tubercles in the liver would lead one to suspect that the disease had been congenital. It could not be proved to a certainty that the milk the calf had been getting was from a cow affected with tuberculosis. The calf did not suckle, but had been fed on mixed milk from a number of cows. I failed to get any account of the dam.

In the course of an extensive practice of many years, numerous post-mortem examinations have been made to verify the cause of death. And it is quite possible that in some cases evidences of tubercular deposits might have been found if carefully looked for in animals dying from other diseases. But in the cases of fat cattle for the butchers, tuberculosis has been especially looked for, with the results as described.

None of the contagious or infectious diseases that have produced such disastrous effects amongst the herds of cattle in most other countries have ever gained a foothold in Canada, and with the exception of tuberculosis, which I firmly believe does not exist to anything like the extent in Canada that it is said to in some of the older countries of the Eastern hemisphere, we are free from contagious diseases in our cattle.

Tuberculosis from its insidious nature, its fatal character, and extending, as it does, over most parts of the world—it is of the utmost importance that every effort should be made to abate or check its ravages.

The following Paper—

TUBERCULOSIS IN THE STATE OF VICTORIA,

was presented by G. PENTLAND, Chief Inspector of Stock for the State of Victoria :—

Early in the year 1883 the attention of the District and Border Staff was called by the late Chief Inspector of Stock, Mr. Curr, to the fact that diseases of cattle known as tuberculosis (consumption) and "*cancer*" (lumpy jaw), now known as actinomycosis, were becoming more common and appeared to be gaining ground.

At that time little was known of the nature of these diseases, but the brilliant discovery by Dr. Koch, in 1882, of tuberculosis being due to a minute rod-like organism, the *Bacillus tuberculosis*, awoke the scientists of the world to inquire into the value of this great discovery. In 1883 the Hon. James Buchanan, M.L.C., an experienced stock-owner, called the attention of the Victorian Government to the fact that it was necessary that a board of experts should be appointed "to inquire into the existence and extent in this Colony of the disease in cattle known as tuberculosis; whether its existence is likely to be detrimental to the public health, and what preventive measures should be adopted"; and in 1885 the Board recommended, after very exhaustive inquiries, that tuberculosis be placed on the schedule of contagious diseases under the Stock Act, 1870, which was done in the year 1887, and since then this department has been able to deal with visibly affected animals in the same way as with pleuro-pneumonia and other infectious diseases. Previous to this power being given by law, there was no power to cause tuberculous animals to be destroyed, although a large number were willingly destroyed by owners at the instance of inspectors, who generally used to a large extent moral suasion in these matters. We are now constantly destroying affected animals in the course of our inspections, both in the districts and on the borders, as the annual returns hereunder show.

In the year 1893 special instructions were given by the Secretary for Agriculture to have all dairy cattle inspected as closely as possible by the District Staff, and I think I am safe in saying that this instruction has been faithfully carried out. The District Staff is composed of practical men experienced amongst stock and accustomed to country life and the ways of the bush. They have in the past been successful in stamping out scab, and also have met with great success in coping with and keeping down pleuro-pneumonia by the measures of slaughter, quarantine and inoculation. The duty, then, of combating tuberculosis has fallen to the stock branch, whose primary business is to see that infectious and contagious diseases are kept out by land and sea and to prevent the spread of any infectious or contagious disease within the State. Tuberculosis, pleuro-pneumonia, actinomycosis are all imported diseases; were introduced at a time when there was no department for their prevention or control, hence they gained great headway, and would do so again if there were no stock departments throughout Australasia to keep them in check. Besides having practical and experienced

men to travel the districts, there are attached to the department six veterinary surgeons in private practice, whose services are sought in special cases where special inquiry or demonstration is necessary. They are called upon, in conjunction with inspectors of stock, to inspect all foreign stock arriving at this port, both before landing and again before its release from quarantine. We thus have a staff equal to any emergency, and in the regulations we have hard-and-fast rules for the guidance of owners of stock and the general staff. As regards the general condition of dairy stock, I reported in June, 1893, that dairymen, as a rule, vie with each other in keeping the best class of stock, it being the best cows that yield a profit, and that odd cases of tuberculosis crop up once in a way which they readily get rid of; but that on the whole the health of our dairy stock was excellent, and would compare favourably with the same class in any part of the world, owners being only too anxious to maintain the excellence that had been obtained. In a report, dated 2nd November, 1896, I stated that it was upon the principle of stock-owners destroying diseased animals themselves, aided by the inspectorial staff, that pleuro-pneumonia was kept in check, and it has been upon the same principle and with the same aid that tuberculosis has been got under. But the greatest factor we have in preventing the spread of tuberculosis is the open-air life which our cattle live, and this fact accounts for the greater freedom from tubercular disease than the cattle of Great Britain, Denmark, and other European countries, in which they are housed and hand-fed for the best part of the year. On disease breaking out in the confined atmospheres of byres, the infection spreads rapidly throughout, and there is a larger percentage of animals affected than there would be if they were living under more favourable conditions of hygiene. We therefore have an advantage over countries whose climatic conditions are not so favourable as ours. The sun's rays, too, are all-powerful in destroying the bacillus of tuberculosis, and the success of any scheme for getting rid of, and keeping rid of, tuberculosis will depend on cleanliness, and having cow-sheds and yards built so as to get as much sunlight as possible. It is to be remembered that darkness and dirt, overcrowding, and imperfect ventilation favour the spread of tuberculosis. No infected or suspected animals should be allowed to mix with the healthy, and among the many ways of infection being spread is that of healthy animals licking affected ones; and in small dusty areas or yards, where diseased animals have been, the dry particles containing the germs of disease are floating about, and are therefore a menace to man and beast.

Statistics.

Since 1885, the year of the Board's report, which showed that 7 per cent. of all cattle were affected in various degrees, the percentage has been decreasing at a satisfactory rate according to the statistics obtained at the city abattoirs. In 1896 the return showed that all cattle were affected to the extent of 4 per cent., and a later return for twelve months ending 30th

June, 1899, showed that bullocks were affected to the extent of 3 per cent.; cows 5 per cent.; and calves, one only out of 3935 was found to be affected. For the year ending 31st December last the return furnished by the superintendent of city abattoirs is as follows:—

Cattle.	Tuberculosis.		
	Number slaughtered and inspected.	Number affected in various degrees.	Number condemned and destroyed.
Bullocks	36,125	No record kept.	66
Cows	8,517		64
Calves	3,532		*Nil*
Totals	48,174	—	130

The percentage of disease found at the city abattoirs is necessarily much greater than that found by inspectors in live stock, and therefore it is only the rough of the herds that are culled, so that affected animals showing no external signs escape; but, nevertheless, the general condition of our dairy and other classes of cattle is improved, whilst in every animal that is destroyed and the carcase burnt the centres of contagion are thereby lessened and kept in check, and suspicious cases are dealt with under the tuberculin test or by isolation. The following statement shows the number of dairy and other cattle inspected and killed in the districts on account of tuberculosis for the period 1894–1900:—

Year.	Cattle.	Number inspected.	Killed for Tuberculosis.
1894	Dairy	119,450	315
	Other	194,373	276
1895	Dairy	108,169	325
	Other	236,651	269
1896	Dairy	120,709	320
	Other	245,448	229
1897	Dairy	102,972	270
	Other	227,167	182
1898	Dairy	91,397	220
	Other	257,387	237
1899	Dairy	87,360	151
	Other	227,008	141
1900	Dairy	85,413	115
	Other	202,044	114
		Total killed	3,164

Besides the above numbers of cattle killed for tuberculosis, there are always considerable numbers isolated to prove the existence of disease; and the numbers killed on further inspection appear in returns later on.

To the above is to be added the number of tuberculous cattle inspected on the borders for the period 1891–1900 (see next page).

Tuberculosis.

Year.	Number inspected.	Number refused admission.
1891	128,957	619
1892	69,491	182
1893	43,371	60
1894	39,182	69
1895	35,208	116
1896	35,212	75
1897	46,343	133
1898	30,317	1
1899	42,398	33
1900	32,969	10
Total	503,448	1,298

When the tuberculin test has been applied to dairy cattle not more than 9 per cent. of reactions have been obtained, and it is to be borne in mind that the bulk of these cattle were living largely under artificial conditions, and, as a sequence, a large percentage was obtained; whilst in another part of the State, where cattle were living under more natural conditions, no tuberculosis was found. On this point it is found that tuberculosis is much less common in the general bovine population than in dairy cattle and cattle slaughtered at the abattoirs. Taking the statistics of our city abattoirs at, say, 3 per cent. of all cattle slaughtered in various degrees of tuberculosis—and, according to the latest return, as above given, this certainly is an outside estimate, but may be taken as a basis—we find that there is no comparison between the cattle of this State and those of the older countries, which show unmistakably that they have five times more tuberculosis than we have, or that their average may be set down at from 15 to 20 per cent. Our comparative freedom from this and other infectious and contagious diseases is mainly due to the favourable conditions of our climate and outdoor life.

No Compensation.

Owners of tuberculous stock are generally only too pleased to get rid of diseased stock without compensation and without delays, their motto being, "The first loss is always the best loss." No compensation was given in the case of scab, nor in the case of pleuro-pneumonia. It was only given when an outbreak of a new disease—foot-and-mouth disease—occurred in this Colony about thirty years ago, and in the case of some scabby sheep being illegally destroyed. Compensation for valueless beasts has not been asked by owners of cattle or sheep, as they do not place any value on stock suffering from disease, and they readily consent to destruction without raising the question of compensation when inspectors make their condemnations. Clause 10 of the Act clenches this matter, as it provides that under an Order in Council owners of diseased stock shall have no claim for compensation when destroyed at the instance of inspectors. Diseased

animals are usually destroyed and opened on the nearest available spot, and the diseased parts shown to the owner, who profits by the object-lesson. This course is highly educational to them in getting affected beasts destroyed at once, without waiting for the action of this department.

In the case of the tuberculin test, I may here state that owners of apparently healthy animals reacting and slaughtered, and showing but slight lesions, complain of the losses they sustain, and would claim compensation in such cases if the tuberculin test were compulsory. Some owners argue that their cattle might live for years where the lesions are slight, and might heal up, or make no further progress; but, on the other hand, if the test disclosed generalised tuberculosis, or one or more organs badly affected, then they would not apply to be compensated.

Powers of Inspectors.

The Diseases in Stock Act, 1890, consolidating the laws relating to diseases in stock, provides by Section 6 that inspectors of stock shall have power to enter at any time any ship, or any land, or any building, not being a dwelling-house, for the purpose of inspecting any stock.

This is a power which enables an inspector to find out for himself the state of his district as regards disease, and has a certain amount of influence among stock-owners in reporting disease. I understand that in England inspectors have no such power, and if this be the case, owners of affected stock can do just as they like, either report disease or give notice of such for compensation, or send stock that has been in contact with affected stock to the market yards for sale, since they have nothing to fear whilst an inspector has no power of entering.

Regulations for placing diseased stock in quarantine are in force in this State, and this power, judiciously exercised, enables an inspector to have affected stock destroyed instanter, with the consent of the owner. The owner readily consents to destroy affected stock, knowing the power the inspector has in seizing and quarantining diseased stock and placing all other stock in quarantine. The owner, however, can refuse to destroy his affected stock until an Order in Council is obtained, and in this he has the right to appear.

As regards foreign and inter-State stock we have sufficient power to fix any condition that may be justifiable for introducing certain kinds of stock, and this enables us to prevent stock by sea or land being introduced if they are affected with tuberculosis or any other disease, and the "Health Act" gives power to prohibit any kind of stock, whether diseased or not.

Members of Police Force Assist.

Clause 10 of Regulations of November 11th, 1890, gives power to any inspector of stock, officer of Customs, or any member of the police force, to detain and prevent the travelling of stock newly introduced into Victoria

by sea or land until the regulations have been complied with. And there is a standing order that the police report forthwith to the district inspector, or Chief Inspector of Stock, any disease coming under their observation or reported to them. The police also are empowered, under Section 52 of the Health Act, 1890, to seize any animals or carcases which appear to be diseased or unfit for human consumption. The police assist us very materially in reporting cases of tuberculosis which are often reported to them quietly by the public, who do not care to write or have their names appear in any way. Through the police, then, a large number of cases of tuberculosis are disposed of which could not otherwise be done. The police also generally assist the district inspectors in shooting affected cattle and getting their carcases burned or buried.

Districts Too Large.

The districts assigned to each inspector for the inspection of dairy cattle are too large and unwieldy, and the requirements of the dairying industry, which has grown so large of late years, justify closer and more regular inspection than obtains at the present time. Government supervision under central direction has been successful in the past, because there is uniformity of action in working the districts, but the same cannot be said of local government, where there is no combined action whatever. As a case in point, we have only to look to recent events in the shires of North Gippsland in the matter of rabbit suppression, the want of decision and the want of immediate action on the part of the various shires. The rabbits are now getting a strong hold of the country between Bairnsdale and Omeo, and it is only a question of a short time when the pest will be—if it is not now—thorough master of the situation. If the various shires had combined at once and got a number of inspectors and others to work in time, the evil might have been averted. In the same way are nearly all the shire councils throughout the State dallying with the supervision of the dairy stock of the State. Only some few have, or are about to appoint, inspectors to inspect the dairies and stock of two or three or more combined shires, each contributing its share of expense. If this scheme becomes general it is to be hoped that there will be closer inspection of the dairy herds, devoid of all local influences, for it is impossible for the five district inspectors now travelling the country to do more than to attend to special calls made upon them and to special cases of disease and mortality. The Government system is the right and correct one, and would be much more effective and give more decided results if more officers were in the field. And if the Government appoint more inspectors in the dairying interests there will still be plenty of work for the local authorities under the Health Act.

General Quarantine Impracticable.

Unlike other infectious and contagious diseases, tuberculosis is so slow of development that it is impossible to say how many animals in a herd are

affected. It was hoped when the tuberculin test was discovered that results of a satisfactory nature would be afforded the cattle-raising industry, but so far there does not seem to be any great desire on the part of Australian cattle-owners to have the test applied to their herds. The cattle that react should be dried off and fattened for slaughter, whatever the result may be when opened. The test, considered from the most favourable point of view, has its advantages and disadvantages, so that to make it a Government measure, having for its object the destruction of reacting animals, a compensation fund would certainly require to be provided, and in this matter it has been estimated that in England it would take £19,000,000 sterling to get rid of the disease. Three and a quarter millions of cows would have to be taken from the milking sheds and slaughtered. This is a very grave matter, and points to the necessity of other alternatives or ameliorative measures being devised. I know of no better method of gradually getting rid of tuberculosis than plenty of fresh air, sunshine, and slaughter of visibly affected beasts. The sun's rays are death to the bacillus of this disease, therefore every effort should be made by the people in the old countries to try hygienic methods for the cure of tuberculosis, both in man and beast. This fact is sufficient for the local authorities to have sanitary laws enforced, the doing away with everything that tends to promote disease, the thorough ventilation of byres and drainage of same, the cleaning and keeping clean all cows in milk, and the utensils and gearing used in connection with the dairy.

These matters cannot be repeated too often, for it stands to reason the more fresh air we get the more vitality we have in resisting the enemy. A stock-owner has a perfect right to get rid of disease in his dairy herd in the same way as her late Majesty the Queen did in getting rid of the cows which reacted to the tuberculin test at Windsor. This is a matter which touches the pockets of owners directly, and no one can take exception to any owner attempting to purify his herd in the most effective manner he can, and in the interests of health.

The Tuberculin Test.

The United States have not been slow in following up the discovery of Koch's tuberculin cure for consumption in the human being. The State of Vermont some years ago made experiments in regard to the test, and one of the objections taken to it was that tuberculin does not determine the stage of the disease, but condemns animals that might live for years and possibly recover. This objection seems to me a fatal one in respect to making the test a compulsory measure, and therefore it can only be a means privately of finding out the existence of tuberculosis or not. It appears, therefore, that we have yet to learn other scientific methods of a more exact nature than that disclosed by the tuberculin test. The test does not allay the progress of the disease, but, on the contrary, increases its severity, stirs the minutest lesions, and therefore brings to a climax the disease in a generalised form, which otherwise might have lain dormant for all time to come. We have to apply

preventive methods as the easiest and surest way of dealing with tuberculosis, and if the tuberculin test is not allowed in the case of the human being, why should its use be advocated for determining the existence in the bovine species?

Some of the cattle-breeders of the United States and Canada have protested against the use of tuberculin as a test for pure-bred cattle being allowed to be imported, on the ground that it is "unreliable and unsatisfactory," and in the same sentence it is pointed out that it is of great use to the cattle-owner who wishes to maintain a healthy herd, but that imported stud cattle should not be subjected to the test.

As regards this exception I can only say that importers in this State of pure-bred cattle have it in their power to have their cattle tested just as they please before shipping them from foreign ports, and this has been done in one or two instances within the last two years. The quarantine of all suspected animals should be insisted on in all cases that react, with the alternative of immediate slaughter if quarantine cannot be maintained. I have just lately heard of a stock-owner having gone to the trouble of getting his herd tuberculined professionally, and that when the animals which were put away to fatten were killed the tuberculin test proved to be satisfactory. Cases of this kind, however, I should be glad to have made official, or at any rate brought under official observation.

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